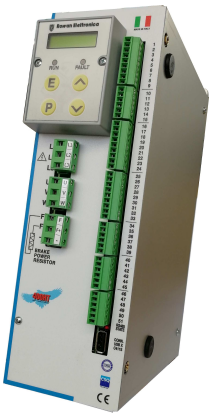
INVERTER SERIE 400

(BRUSHLESS ASYNCHRONOUS VECTOR DRIVE)



FLYCUT

REGULATOR

ELECTRONIC GEAR

WINDER

POSITIONER

LIFT

CLOSED LOOP VECTOR CONTROL

V/F SCALAR CONTROL WITH HIGH TORQUE

SERIAL COMMUNICATION

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UNI EN ISO 9001

Caution ! → **INFORMATION ON THE STRUCTURE OF THIS MANUAL:**

Chapter 1, Chapter 2, Chapter 3, Chapter 4 concerning the first pages could be considered as a quick start manual, since they include those basic information for a quick installation; for this reason, the first thing to do is to read these chapters entirely and then to examine closely their subjects in the following pages.
Chapters from 2 to 18 contain the information on the inverter Series 400.
Chapters 20, 21 contains information on parameterization and connection of the Rowan G-Series vectorial motors
At chapter 19 you can find the description of more manuals dedicated to the 400 series of inverters.
Chapter 22 contains the quick start, Rowan inverter in vector control with other brand asynchronous motors.

Description of symbols in the manual

Caution !
Warning !

It means that the following subject is very important and must be read carefully

It means that the following subject is linked to a generic danger for safety.

It means that the following subject shows the presence of a dangeruos voltage. It indicates that high voltage may cause dangerous accidents or death.

When using the device or the internal cards take care on avoiding the generation of electrostatic discharges (ESD) that may cause irreparable damages to some of the components.

Caution ! GENERAL WARNINGS BEFORE INSTALLATION

- Before installation, connection or any operation on the inverter or on the motor, read this manual carefully, in order to perform correct operations and to pay attention to safety rules.
Any use of the Rowan inverters and motors which may differ from what is written on this manual is strictly forbidden.
- This instruction manual is addressed to skilled personnel, who is acquainted with installation and use norms in accordance with safety and protection standards. Both the motor and the inverter when connected may be dangerous for things and people. The user is responsible for a correct installation, which must be in accordance with the directives in force.
- The inverter belongs to the restricted sales distribution class in compliance with EN61800-3 standard. In a domestic environment this product may cause radio interferences, in which case the user may be required to take adequate safety measures.
- The inverter, the possible external filter and the motor must be earthed permanently and properly and must be protected from the supply voltage in accordance with the directives in force.
- The max. inverter protection is obtained by B differentials, preferably 300mA-type. Internal or external anti E.M.I. filters have a leak of current to ground (see table on page19); Please remind that the EN50178 directive says that, in case of leakage current >3,5mA, the earth wire must be steady and doubled.
- When the inverter cover needs to be removed, as e.g. for DIP switches setting or for maintenance, it is compulsory to wait for at least 5 minutes after inverter quenching for the internal capacitors to discharge. Internal components and terminals subject to dangerous voltages (L1, L2, L3, U, V, W, F, F+, -) can be touched only in absence of power supply and when the power supply between F+ and – terminals is <50Vdc. Please remind that most internal components are sensitive to ESDs, so limit yourself to set DIP switches without touching any other component.

Dangerous situations

In peculiar setup conditions of the inverter, after power losses, the motor might start automatically. The motor rotation manual controls which can be set by the keyboard must be used with great attention, in order to prevent mechanical damages and accidents against people. Setup errors might cause unintentional starts. At first start, in case of faults on the inverter or of lack of power supply, it may not be possible to control the motor speed and the direction. The rate contact can't be held as valid for a safety stop; in some setup conditions or of inverter faults, its disabling may not be followed by a prompt stop of the motor. Only the inverter electromechanical disconnection from the power supply excludes any action on the motor.

The installation of the inverter in areas at risk, in presence of inflammable substances, combustible vapours and dusts may cause fires and explosions; the inverters must be installed far from this kind of areas.

Avoid the penetration of water or any liquids into the machine in any case.

Do not perform dielectric rigidity tests on the drive parts.

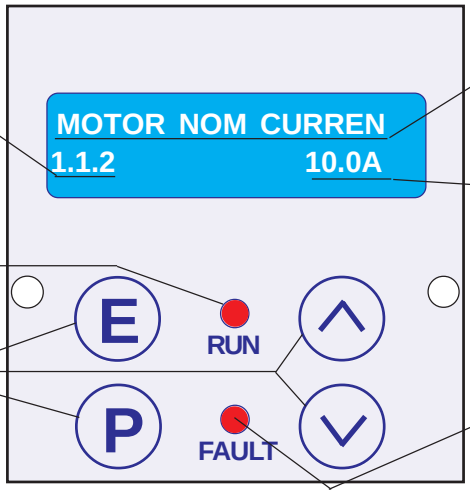
Responsability and warranty

- **ROWAN ELETTRONICA s.r.l.** declines any responsibility for any inaccurancies contained in this manual, due to printing and/or transcription mistakes. It reserves the right to make any variations that it considers necessary for better functioning of the product, without prior notification.
- **Regarding the data and characteristics** mentioned in the manual, a max. 10% tolerance has been allowed, if not otherwise indicated. Diagrams are mere examples and should be perfected by the customer.
- **The product warranty** is considered ex-works, according to the conditions written on the specific document to be asked ROWAN Sales Department, or download it from www.rowan.it.

Keyboard general description

The keyboard enables to change operation parameters (saved in eeprom) and to visualise useful data during the working phases such as: speed reference, motor reference and frequency, motor current, line voltage and last fault occurrence. Thanks to serial connection, the keyboard can be distanced from the panel of a control panel by a max. 25m distance.

ROWAN ELETTRONICA s.r.l. supplies on request the keyboard distancing cable.



Display area for the order number of the selected menu/parameters/variables

Note: if the code is too long, only last part is shown

Display area for the description of the selected menu/parameters/variables

Display area for the string or numerical value of the selected parameter or variable

***RUN**: LED signalling drive running and operational*

Mechanical keys for setup

***FAULT**: Light with two functions:*

***Flashing** = ALARM*

***Fixed** = INVERTER BLOCK*

See Chapter 17 "INVERTER FAULTS AND ALARMS" to know the reason for the alarm or for the inverter block.

The keyboard is made up of:

- an alphanumeric LED display, 2x16 characters, backlit
- four mechanical keys that give the feel of the key that has been pressed
- two signalling LEDs, one for run (RUN) and one block for fault (FAULT)

Keys function

E **ESCAPE** key, return to the main menu or to the upper level and save the settings.

P **PROGRAM** key, enter in the sub-menus, modify the parameters with the selection of one number at a time in the case of numeric value.

UP key, scroll FORWARD the variables viewed and set by increasing the numerical digit selected from the PROGRAM key.

DOWN key, scroll BACK the variables viewed and set by decreasing the numerical digit selected from the PROGRAM key.

Display when starting

The machine starts in DISPLAY STATUS and shows one among the 10 default variables from the 2.1 DISPLAY VARIABLE menu. Use UP and DOWN keys to scroll variables. The last variable selected is displayed when starting. See Chapter 10: PARAMETERS AND VISUALISATIONS, on paragraph "DISPLAY STATUS description" to change the default variables displayed.

Procedure to modify a parameter

For example, to modify the parameter 1.1.2 MOTOR NOM CURRENT in the menu BASIC DATA, from the DISPLAY STATUS:

> Press the P key, at this point the 1.1.1 LINE VOLTAGE menu will appear.
> Press the UP key to select par.1.1.2 MOTOR NOM CURRENT.
> Press the P key to modify the parameter:
in the display field dedicated to the numerical value to be set the first number to the right (the least significative) will begin to flash to indicate that it is now possible to modify its value using the UP and DOWN keys.
> Press the UP key to increase the value and the DOWN to decrease it.
> To modify the other numbers it is enough to press the P key with one impulse, at each pressure the following number is selected on the left, until the most significative to then return to the least significative and so on.
> In the case of a positive and negative parameter, the sign will appear after most significative number; to modify it press the P key until it is selected and then, with the UP key set the sign **+** and with the DOWN key the sign -
> To memorize the value press the ESCAPE key (the selection will stop flashing).
> To return to the starting level (DISPLAY STATUS) press the ESCAPE key again. The procedure to modify the parameters with a selection string is exactly the same, in this case the UP and DOWN keys will select the strings available in the menu instead of the numerical values.

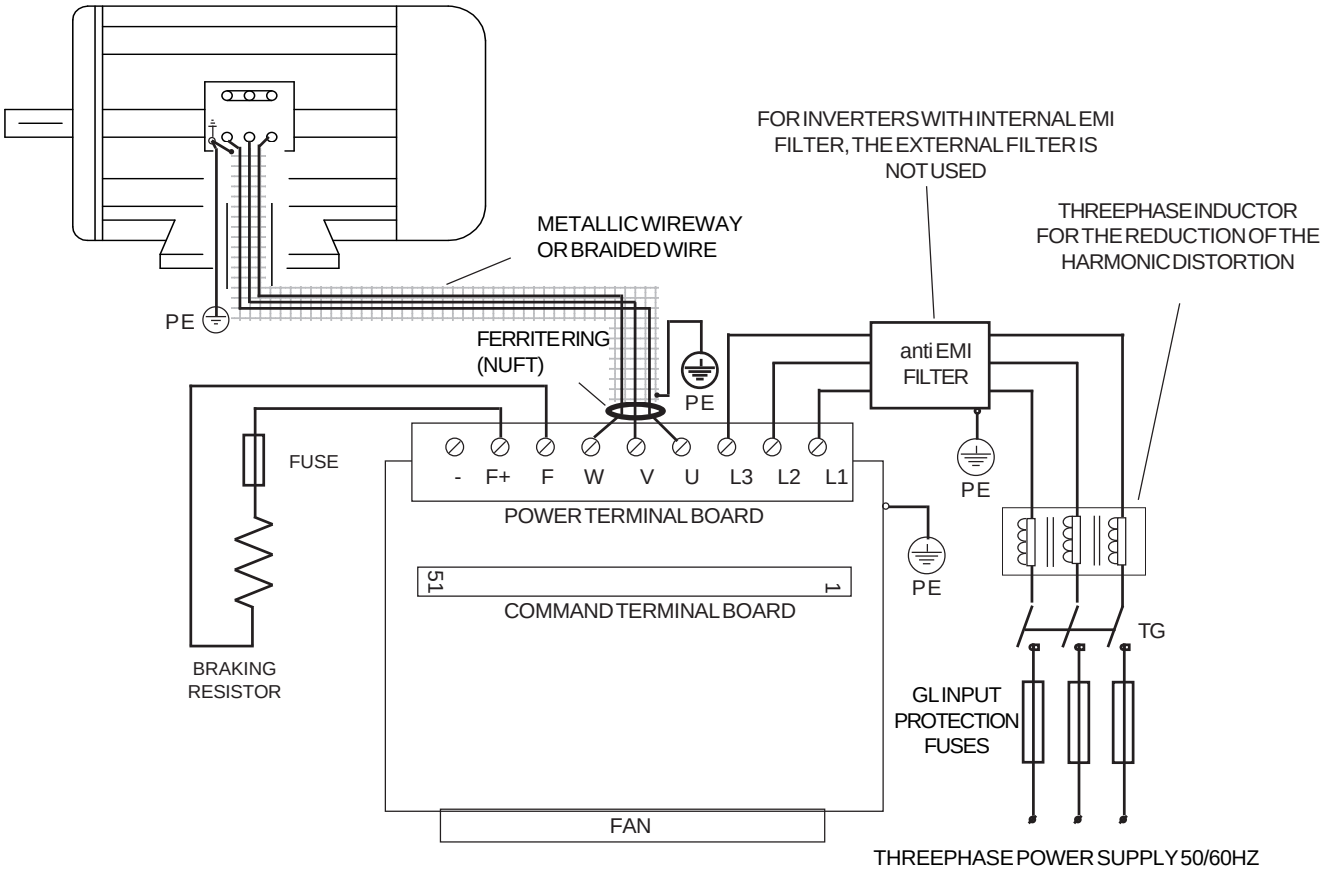
Caution ! → ***The keyboard doesn't contain any parameter buffer (see Chapter 11 PARAMETERS TRANSFER).***

Quick installation aims

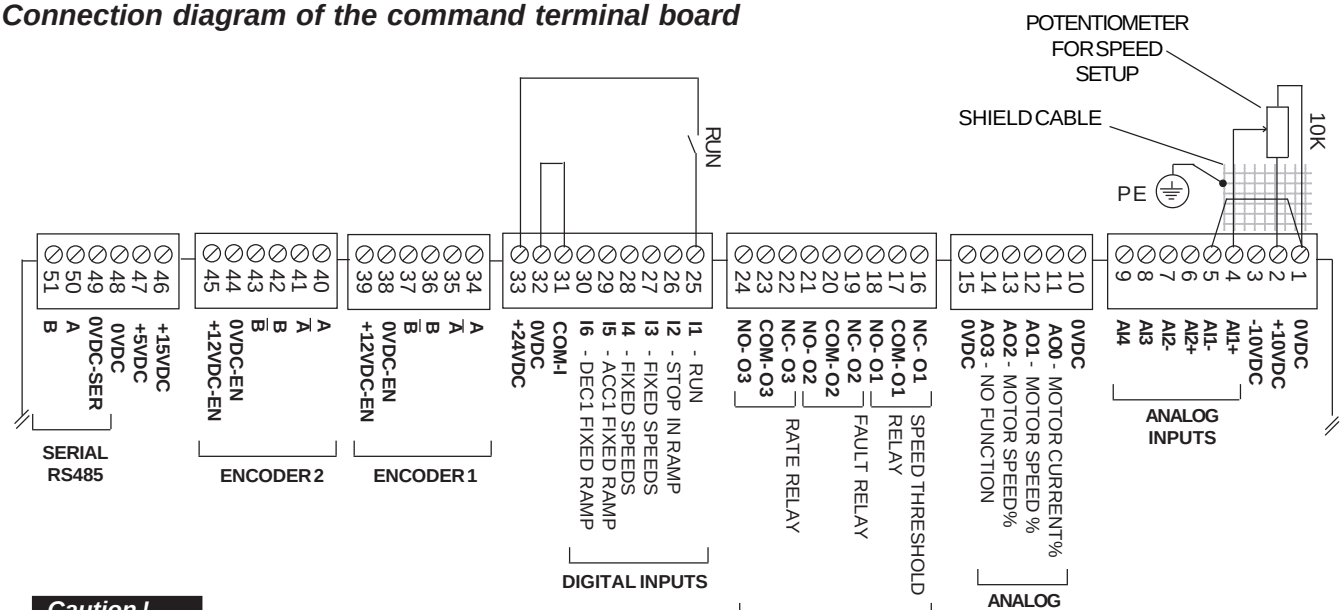
The aim of this paragraph is to teach the user, quickly and correctly, speed setup by a potentiometer of a normal asynchronous motor in V/F (Voltage/Frequency) scalar mode.

Connection diagrams for scalar mode

- ***Connection diagram of the power terminal board*** **(example with star-connected)**



- ***Connection diagram of the command terminal board***



Caution !

Analog/digital inputs and outputs can be programmed freely. The functions shown in this diagrams concern standard programming in SCALAR MODE.

Installation in scalar mode

- Read carefully Chapter 1: GENERAL WARNINGS BEFORE INSTALLATION before installing.
- See Chapter 6: MECHANICAL INSTALLATION for the inverter positioning.
- See Chapter 7: ELECTRICAL INSTALLATION for connecting the inverter and for E.M.C. directives.
- See Chapter 8: BRAKING RESISTORS for connection, if neccessary.
- Connect the inverter with ref. to the ***Scalar connection diagrams*** on the previous page.
- See Chapter 2: KEYBOARD OPERATING INSTRUCTIONS

Start programming with RUN contact off. The RUN contact cannot be held as valid in case of safety stop, since in case of particular programming conditions or of inverter fault, its disconnection might not determine the sudden motor stop.

For safety reasons, it is better to be close to the emergency button to activate the safety function of the system, the inverter's STO function too if it is present (see Safety Manual MANU.STO.350-400-700).

The storage of the inverter for longer than 2 years could damage the DC link capacitors, which shoud be restored: in order to do that, it is suggested to supply power to the inverter in OFF rate for at least 2 hours.

- Supply power to the inverter and check the correct setting of the potentiometer as follows:
- Select the **SPEED REFERENCE** variable by UP and DOWN keys.
- Set the potentiometer at its minimum and maximum rate and check the setting between 0 up to 1500 rpm in **SPEED REFERENCE**.

- Press ESCAPE key and Set SPEED REFERENCE at 0 rpm.
- Press PROGRAM key to enter parameter MOT CONTROL TYPE is displayed:

MOT CONTROL TYPE	
100.1	V/F

This parameter enables to select the following motor control modes:

V/F = Scalar mode

VECT_ENC = Vectorial mode with encoder ring closure

Leave the default setting: **V/F**

- Press UP key to select the parameter

APPLICATION	
100.5	SPEED

This parameter enables to select the application concerning the motor function in the final system. Leave the default setting: SPEED (Motor speed control)

- Press ESCAPE key to return to DISPLAY STATUS
- Press PROGRAM key to modify the following parameters from the BASIC DATA menu:

LINE VOLTAGE	
1.1.1	400.V

Set the inverter supply voltage to the L1, L2, L3 terminals.
Choose the voltage which is the closest to the supply voltage true value. Setup range from 150.V to 600.V

MOTOR NOM CURREN	
1.1.2	10.0A

Set the nominal current of the motor which is connected to the inverter.
Setup range: from 0.0A to a standard parameter value.

MOTOR NOM FREQUE	
1.1.3	50.0Hz

Set the nominal frequency of the motor (frequency to nominal voltage). See the value on the motor plate. Setup range from 1.0 Hz to 800.0 Hz

MOTOR NOM VOLTAG	
1.1.4	400.V

Set the nominal voltage of the motor (nominal voltage to frequency). See the values on the motor plate according to the type of connection (star network or delta connection)
Setup range from 1.V to 2000.V

MOTOR POLES	
1.1.5	4_POLES

Set the nr of motor poles
See the value on the motor plate. Setup range: 2_POLES, 4_POLES, 6_POLES, 8_POLES

RAMP ACCEL. TIME	
1.2.1	10.00s

Set the motor acceleration ramp
Setup range: from 0.01s to 600.00s

RAMP DECEL. TIME	
1.2.2	10.00s

Set the motor deceleration ramp.
Setup range: from 0.01s to 600.00s

MAX MOTOR SPEED	
1.3.1	1500.rpm

Set the motor maximum speed
Setup range: from 0 rpm to 30000 rpm

MIN MOTOR SPEED	
1.3.2	0.rpm

Set the motor minimum speed
Setup range: from 0 rpm to par. 1.3.1 MAX MOTOR SPEED

FIXED BOOST	
1.5.1	1.0%

Set the fixed boost voltage on the motor, active from 0.0Hz to 20.0Hz
Setup range: from 0.0% to 25.0%

Caution !
Boost voltage must not cause an absorption rate which is higher than the motor nominal current. For the first test, set 1.0% as default value

TEST MANU SPEED	
1.4.1	300.rpm

Set the motor speed for the first rotation test, which will be performed later by the manual commands of the keyboard.
Setyp range: from 0 rpm to par. 1.3.1 MAX MOTOR SPEED.
Set to 500rpm.

JOG TEST MANU	
1.4.2	NO

On this parameter, the motor rotation test is enabled by UP and DOWN keys

Select YES to enter the test; the following screen will be displayed**:**

UP=DX	DOWN=SX
SPEED	0.rpm

- **Perform the rotation test by UP and DOWN keys:**
  - Close the RUN contact by switching RUN light on.
  - Press UP and DOWN pointers to drive the motor on both rotation directions.

  SPEED will display the motor speed, which must correspond with the value set in par. 1.4.1.
- Press ESCAPE to end the rotation test by the keyboard; the display will show par. 1.4.2
- Press the UP key; the following will be displayed:

BASIC DATA OK
E=ESC P=CONTINUE

The screen indicates that the setup of the basic parameters to activate the open ring control is over and that we can exit the programming by pressing ESCAPE key. This way you go back to DISPLAY STATUS. Later on, if further functions differring from the aim of the quick installation are necessary, you can scroll the complete menu of the available parameters by PROGRAM key.

- **- Perform the rotation test setting the speed by the potentiometer:**
  - Press ESCAPE key and select **MOTOR SPEED** variable by UP and DOWN keys.
  - Set the potentiometer and verify the motor rotates at the displayed speed.
  - Select the **MOTOR CURRENT** variable and verify the correct absorption by the motor.
  - To change the rotation direction invert the two phases of the motor (e.g. U and V) . Otherwise by 3.1.1.3 REVERSE SPEED, it is possible to program a command to invert the rotation direction.
  - Go on following the instructions on Chapter 4: QUICK INSTALLATION IN VECTORIAL MODE, if this kind of function in necessary. Otherwise **the basic installation has come to its end.**

Caution! → It is possible to check the I/O status by the following variables from the menu **2.1 GENERAL VARIABLE**:
2.1.20 DIG. INPUT I1..8 and **DIG. INPUT I9..14** as for digital inputs
2.1.22 DIG . OUTPUT O1..8 as for digital outputs

Procedure to restore default setup

It is possible to restore all setups and return to standard ones by following the instruction below:
- Disable the rate (RUN light OFF)
- Keep ESCAPE key pressed until **100.1 MOTOR CONTROL TYPE** parameter is displayed
- Press UP key to select **100.6 SETUP** menu

Press PROGRAM key to select the parameter:

RESTORE SETUP	
100.6.1	DEFAULT

Check **DEFAULT** is selected

Press UP key to select the parameter:

ENABLE RESTORE	
100.6.2	NO

Select **YES** and confirm by PROGRAM key; **YES** will be displayed until all default setups are restored. Then **NO** will be displayed.

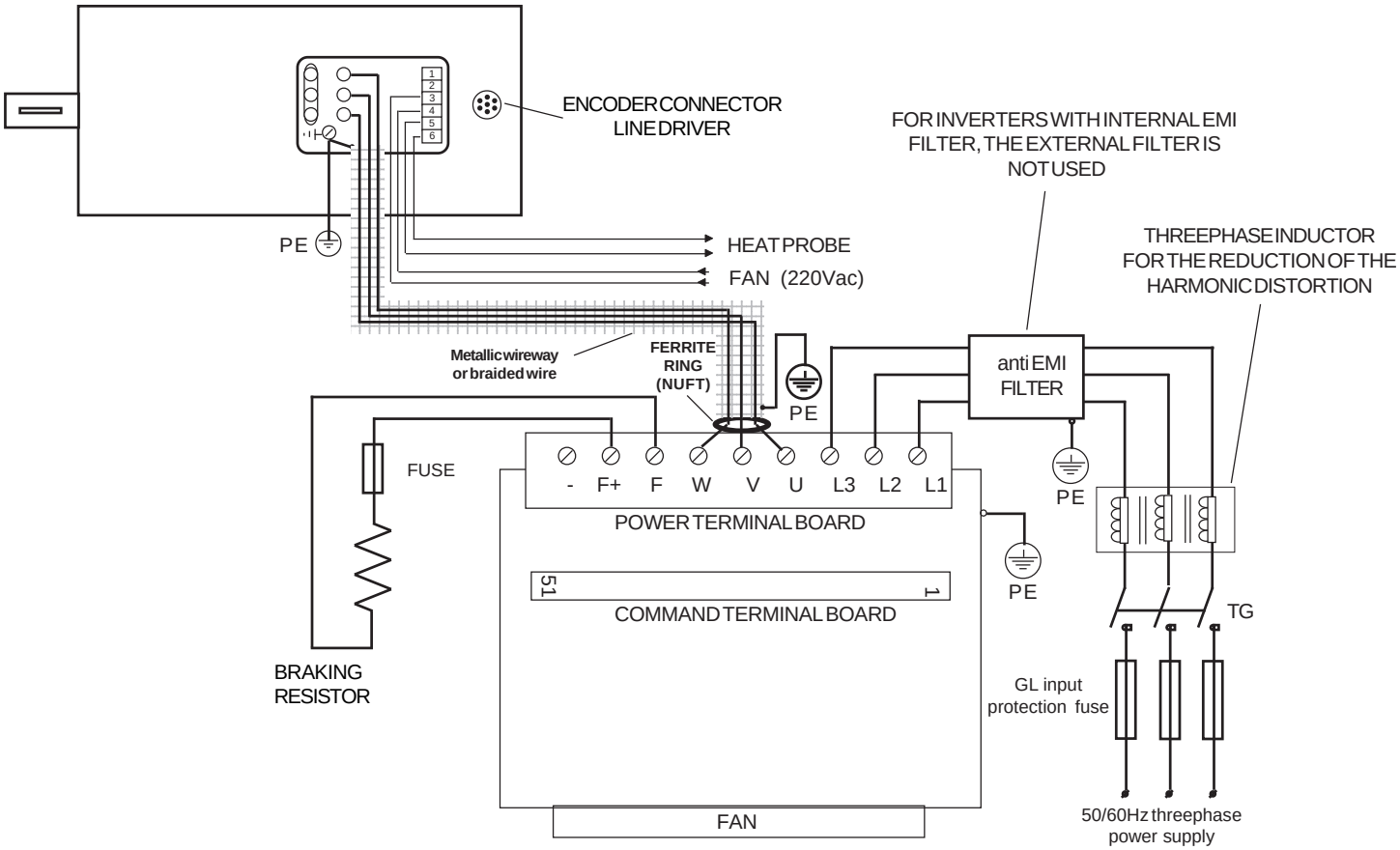
Caution ! → After this kind of operation all customized setups are reset definitively.

QUICK INSTALLATION AIMS

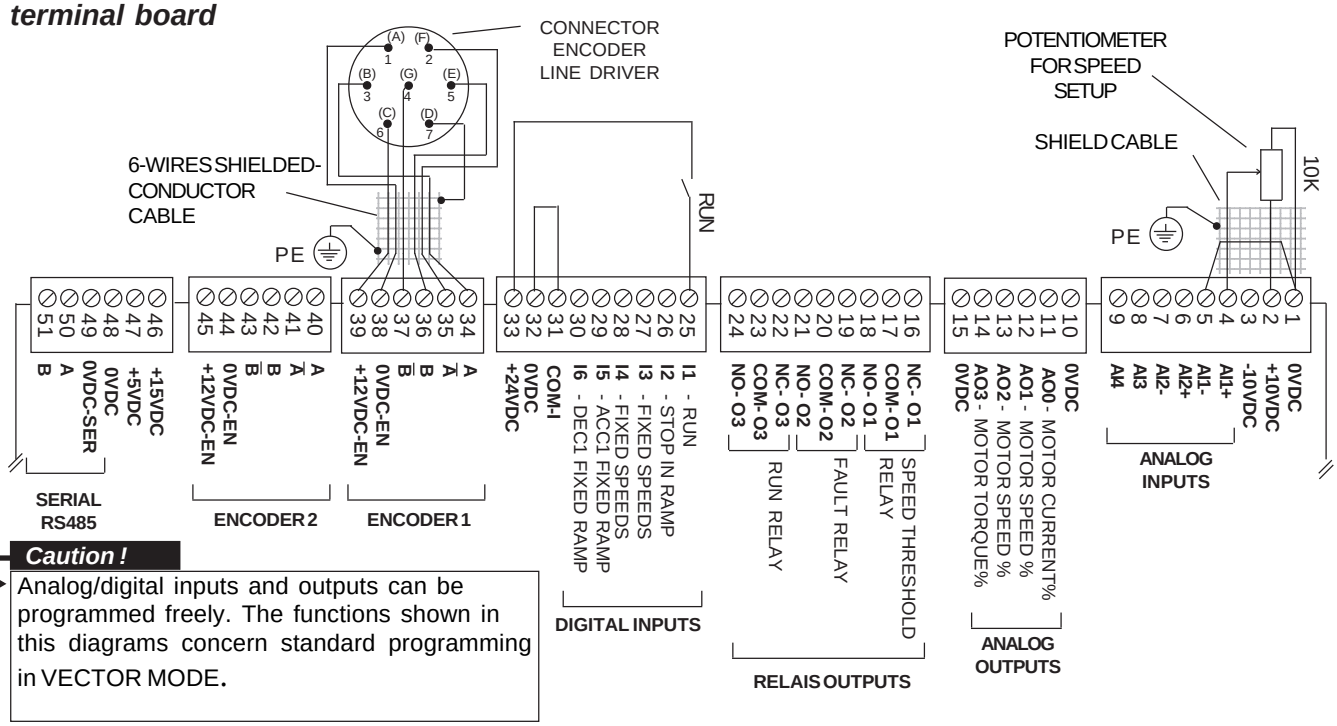
The aim of this paragraph is to teach the user, quickly and correctly, speed setup by a potentiometer of a Rowan asynchronous threephase motor in vector control (FIELD ORIENTATION technique) with closed loop speed feedback from encoder.

Vector control connection diagrams

- ***Connection diagram of the power terminal*** **(example with star-connected motor)**



- ***Connection diagram of the command terminal board***



Caution !

Analog/digital inputs and outputs can be programmed freely. The functions shown in this diagrams concern standard programming in VECTOR MODE.

Installation in vectorial mode

- Connect the inverter with ref. to the ***Vector connection diagrams*** on the previous page.
- Follow **Chapter 3: QUICK INSTALLATION IN SCALAR MODE**, by getting out of the tables on Chapter 20 the **common setup** of the following parameters: 1.1.2 MOTOR NOM CURREN, 1.1.3 MOTOR NOM FREQUE, 1.1.4 MOTOR NOM VOLTAGE, 1.1.5 MOTOR POLES, according to the combination of the inverter with the Rowan vectorial motor. As for motors which haven't been manufactured by Rowan, get the information from the motor plate.
- While performing the final rotation test to verify the speed setup by the potentiometer, check the following variables as well, by selecting them by UP and DOWN keys.

SPEED REFERENCE	*ENCODER SPEED*
0.rpm	*0.rpm*

- Adjust the potentiometer, so that **SPEED REFERENCE** displays the max. speed.
- Check the display in **ENCODER SPEED** variable; on this variable a different speed from that displayed in **SPEED REFERENCE** may be visualized, but **this must be of the same sign**:
  - if the speed sign in **ENCODER SPEED** is opposite to that in **SPEED REFERENCE**, invert the A and A- encoder channels connected to 34-35 terminals.
- Disable the rate (RUN light off)
- Press ESCAPE key until **100.1 MOT CONTROL TYPE** parameter is displayed.
- Press PROGRAM key and set **VECT_ENC** fuction in **par.100.1 MOT CONTROL TYPE.**
- Press ESCAPE key to return to DISPLAY STATUS.
- Press PROGRAM key to modify the following parameters from BASIC DATA menu:

  Set the encoder pulse nr per rotation in **par.1.6.1 E1 ENCODER LINES**. See the values on the plate of the motor encoder.

  The following parameters can be got out of Chapter 20, according to the combination of the inverter with the Rowan vectorial motor (as for motors which haven't been manufactured by Rowan, contact the ROWAN ELETTRONICA technical dept.) :

  - In par. **1.6.2 KG GAIN**, the speed regulator proportional gain.
  - In par. **1.6.3 KI GAIN**, the speed regulator integral gain.
  - In par. **1.6.4 VECT MAGNET CURR**, the motor magnetizing current in % ratio to nominal current.
  - In par. **1.6.5 ROTOR CONSTANT**, the motor rotor constant in Hz.
  - In par. **1.10.1 MAX TORQUE**, the max. torque value in % ratio to nominal torque.
  - In par. **1.10.15 ADAPT PERC TORQ**, the torque displays/setups adaptation value in %.
  - In par. **1.10.16 ADAPT TORQ (Nm)**, the torque displays/setups adaptation value in Nm.
  - par. **1.12.1 PWM FREQUENCY**, PWM frequency for vectorial control (optimal value 5KHz).

  For high power motors, in case of no particular needs for uniformity in rotation, a 3KHz- PWM frequency enables a lower heating up of the power modules and a better exploitation of the inverter.

  For PWM frequencies higher than 5KHz, for noise reasons, keep in mind that you need to derate the inverter following the rule in Chapter 5: TECHNICAL FEATURES.
  At the end of the BASIC DATA parameters , continue pressing the P key, enter the menu INV 1.1 MOTOR DATA and set the following parameters, always according to the chap.20 tables :
  -par. ***1.1.10 MOTOR LOAD FUN C***
  -par. ***1.6.13.1 KP ID REGULATOR***.
  -par. ***1.6.13.2 KI ID REGULATOR***.
  -par. ***1.6.13.3 KP IQ REGULATOR***.
  -par. ***1.6.13.4 KI IQ REGULATOR***.
- Press ESCAPE key more than once to return to DISPLAY STATUS.
- Start with the potentiometer set so that the speed in **SPEED REFERENCE** is 0 rpm.
- Enable the RUN command (RUN light on) and check the correct sped adjustment on the potentiometer, by verifying the display of the following variables: **SPEED REFERENCE**, **MOTOR SPEED** and **ENCODER SPEED**. All variables must display the same speed rate and the same sign.
- Select **MOTOR CURRENT** variable and check the motor absorbption is correct if considered the present load conditions.

Caution !

Default speed adjustment through AI1 analog input is monodirectional; if you need it to be bidirectional, set par. **4.3.1.3 TYPE INPUT = -10V/+10V**

End of quick installation.

Inverter supply voltage to L1, L2, L3 terminals

Threephase voltage supply:
..... from 180VAC to 270VAC (standard power supply 220/240VAC)
..... from 320VAC to 490VAC (standard power supply 380/460VAC) , just for models from 400/P to 400/3,5
..... from 320VAC to 460VAC (standard power supplies 380/440/415 VAC), just for models from 400/5 to 400/G
..... from 380VAC to 560VAC (standard power supplies 440/460VAC), only on request
..... from 560VAC to 760VAC (standard power supply 690VAC) , on request only from 400/5 upwards.

U V W motor output

Types of motor ..... squirrel cage threephase induction motor, Rowan G-Series vector motor
Motor control ..... V/F SCALAR
..... FIELD ORIENTED VECTORIAL, FEEDBACKED BY ENCODER
Output voltage ..... from 0 to 100% of the voltage supply
Output frequency ..... 0Hz - 800Hz
Wave type ..... sine wave
Wave type reconstitution ..... PWM (Pulse With Modulation)
PWM frequency ..... To be set from 0.50KHz to 16.00KHz
Overload capacity with PWM at 5KHz ..... <110% of the inverter rated current in continuos service
..... 110% of the inverter rated current for 300sec
.....max 175% of the inverter rated current for 30 sec (variable value basing on inverter size)
.....max 250% of the inverter rated current for 3 sec (variable value basing on inverter size)

Regenerative braking control

With braking module ..... included in all inverters 400-Series
Regenerated energy dissipation system .....external resistance connected to F+ and F clips

Digital inputs

Nr of digital inputs ..... 6 as standard (I1..I6) + 8 by 404S optional card (I7..I14)
Input insulation ..... optoinsulated in case of external feeding
Connection logic ..... NPN or PNP
Activation voltage ..... 15Vdc min., 30Vdc max.
Programming ..... I1 input with fixed RUN function. The remaining completely programmable
Input resistance ..... about 3,6Kohm
Enabling/disabling times ..... 10ms, 20ms with pulse control

Pulse digital inputs

Encoder nr. ..... 2 as standard + 1 by 404S optional card
Encoder 0 inputs nr ..... 2 by 404S optional card
Input insulation ..... optoinsulated
Connection logic ..... encoder line driver push/pull output
Encoders voltage supply ..... 12Vdc, short circuit protected (5Vdc or 24Vdc on request)
Max. frequency 125Khz
Encoder single channel current load 10mA
Logic state 1 voltage (12Vdc encoder).....more than 6Vdc
Logic state 1 voltage (5Vdc encoder)..... more than 2,3Vdc
Logic state 1 voltage (24Vdc encoder)..... more than 12Vdc

Relay outputs

Relay nr 3 (O1, O2, O3)
Programming ..... completely programmable
Contact nr per relay ..... one NO/NC exchange
Contact current-carrying capacity 0.5A 120Vac- 1A 24Vac
Activation/disable timing 5ms

Digital outputs

Output nr ..... 5 (O4, O5, O6, O7, O8) just by 404S optional card
Output insulation ..... optoinsulated in case of external feeding
Connection logic ..... NPN or PNP
Programming ..... completely programmable
Job voltage supply ..... max. 100Vdc
Max. current 80mA
Enabling/disabling times 12ms

Serial connection

RS485 standard records ..... MODBUS RTU...ROWAN
Baudrate ..... 1200..2400..4800..9600..19200..38400..57600..76800..115200
Insulation ..... .optoinsulated
Protocols on optional card ..... PROFIBUS DPV1, CANOPEN, MODBUS TCP/IP, ETHERCAT, PROFINET

Analog inputs

AI1 ..... differential +/-10Vdc...12bit (14 bit on request)...sampling time 1ms
AI2 ..... differential +/-10Vdc, 4-20mA, 0-20mA...12 bit...sampling time 5ms
AI3, AI4 ..... +/-10Vdc...12bit...sampling time 5ms
AI5 (just by 404S optional card) ..... +/-10Vdc...10bit...sampling time 16ms
AI6, AI7, AI8, AI9 (just by 404S optional card) 0/+10Vdc...10bit...sampling time 16ms
Programming ..... completely programmable

Analog outputs

AO0 ..... 12bit...updating time from 2,6ms (just for FAST variables) to 6,6ms
AO1 ..... 12bit...updating time 6,6ms
AO2, AO3 ..... 8bit...updating time 20 ms
Output supply voltage ..... +/-10Vdc
Output current ..... max. 10mA
Programming ..... completely programmable

Available voltage supply

+10Vdc, -10Vdc (for potentiometers) . .max. 10mA
+24Vdc (for inputs or other devices) .. short circuit protected...max.250mA
+12Vdc (standard for encoders or sensors).....optoinsulated...short circuit protected...max.200mA
+5Vdc (on request for encoders or sensors).....optoinsulated...short circuit protected...max.500mA
+5Vdc ..... short circuit protected...max.200mA
15Vdc ..... short circuit protected...max.200mA

Protections

Inverter ..... Fault for thermal/electronic protection (I x I x t) on overloading on U, V, W terminals
..... Fault for protection on max. peak current U, V, W
..... Fault for programmable time-threshold protection on output current on U, V, W clips
..... Fault for short circuit among U, V, W phases and between the phases and ground
..... Fault for BUSDC overvoltage
..... Fault for overheating of IGBT modules
..... Alarm without fault for BUSDC capacitors life end
..... Fault for short circuit on F and F+ terminals for braking resisitor connection
..... Line voltage dips protection (always enabled) and managing (if enabled)
Motor ..... Fault for thermal/electronic protection (I x I x t) on overloading
..... Fault for overspeed
Braking resistor ..... Fault for threshold thermal/electronic protection on prolonged overloading

Special applications

..... ELECTRIC SHAFT (Code 400A)
..... POSITIONER (Code 400A)
..... FLYCUT (Code 400A)
..... DIE-CUTTER (Code 400F)
..... REGULATOR (Code 400R)
..... WINDING/UNWINDING (code 400W ONLY)
..... Motor with brake in LIFTING systems (LIFT function, in all versions)

Environmental characteristics

Working temperature..... from -5°C to +40°C
Heatsink temperature ..... rom -5°C to +70°C
Storage temperature ..... from -25°C to +70°C
Altitude ..... max. 1000mt a.s.l. (over this the load must be reduced by 1% every 100mt)
Protection level IP20
Relative humidit..... from 5% to 95% without condensation

Law conformity and electromagnetic compatibility

The 400-Series drivers have been designed to operate in an industrial environment. They are **EC products** in compliance with the **EMC 2014/30/CE** directive with reference to the **CEI EN 61800-3 (Cat. C2)**, if connected following the wiring system in Chapter 3,4 and 7.

As for the models without internal filter, they are in compliance with the EMC directive only if connected to the relevant filtering devices supplied separately.

Moreover the drives are in compliance with the **Low Voltage directive LVD 2014/35/UE** with reference to the **CEI EN 61439-1/2** and **CEI EN 60204-1** standards.

Caution! This product belongs to the restricted sales distribution class in compliance with **EN61800-3 (Cat. C2)** standard. In a domestic environment this product may cause radio interferences, in which case the user may be required to take adequate safety measures.

SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 400 FROM /P TO /6

INVERTER POWER SIZE				/P	/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6
MAX. POWERS APPLICABLE IN U- V- W OUTPUTS	LINE 230Vac	Pmotore* kW		0,63	1,3	1,7	2,3	3,5	4,5	6,5	8,1	10	13	18,5	22
		Smax* kVA		1,2	1,8	2,7	3,6	4,7	6	8,7	10,5	13	17	23,8	28,6
	LINE 400Vac	Pmotore* kW		1,1	2,25	3	4	6	7,5	11	15	18,5	22	30	37
		Smax* kVA		2	3	4,8	6,4	8	10	15	20	25	30	41	50
	LINE 690Vac	Pmotore* kW		-	-	-	-	-	-	-	-	-	-	50	55
		Smax* kVA		-	-	-	-	-	-	-	-	-	-	60	65
NOMINAL CURRENT IN L1- L2- L3 INPUTS	LINE 230-400Vac	A		3	5	7	9	12	15	22	30	35	45	60	72
	LINE 230-400Vac with reactance	A		2,25	3,75	5,2	7	9,2	11,5	17,5	25	29	36	48	58
NOMINAL CURRENT IN U- V- W OUTPUTS	LINE 230-400Vac	A	MAX IMPOSTABILE	3	5	7	9	12	15	22	30	35	45	60	72
			ASSOLUTA*	3,3	5,5	7,7	9,9	13,2	16,5	24,2	33	38,5	49,5	66	79,2
	LINE 690Vac	A	MAX IMPOSTABILE	-	-	-	-	-	-	-	-	-	-	50	55
			ASSOLUTA*	-	-	-	-	-	-	-	-	-	-	55	60,5
MAX. CARD BLOCK CURRENT IN U - V - W OUTPUTS		A		8,5	13	20	25	34	42	62	84	98	126	170	200
L1- L2- L3 INPUT PROTECTION FUSES gL or GG TYPE		A		4	6	10	16	16	20	25	32	40	63	80	80
BRAKING CURRENT F F+ OUTPUT IN CONTINUOUS SERVICE WITH REACTANCE	LINE 230-400Vac	A		5,3	5,3	11	11	11	14	25	36	36	42	64	125
	LINE 690Vac	A		-	-	-	-	-	-	-	-	-	-	64	125
MINIMUM BRAKING RESISTOR F F+ OUTPUT	LINE 230Vac	OHM		150	150	73	73	73	57	32	22	22	19	12	6
	LINE 400Vac	OHM		150	150	73	73	73	57	32	22	22	19	12	6
	LINE 690Vac	OHM		-	-	-	-	-	-	-	-	-	-	17	9
MAX. DISSIPATED POWER (HOLDER WITH 5KHz PWM)		kW		0,05	0,1	0,2	0,25	0,3	0,4	0,5	0,55	0,6	0,7	1,0	1,2
COOLING FAN				NO	NO	NO	SI	SI	SI	SI	SI	SI	SI	SI	SI
INTERNAL EMI FILTER		LINE 230-400Vac		SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI
		LINE 690Vac		-	-	-	-	-	-	-	-	-	-	NO	NO

*** Pmotor KW** = Maximum motor power applied to the inverter output according to 4 poles asynchronous motor standard label value. In case of a motor with different poles, check the compatibility with the inverter output maximum current (6 - 8 poles)

*** Smax KVA** = Max. applicable power with cosphi = 1

* **ABSOLUTE** = The maximum current limit in continuous service on the U-V-W output, without inverter fault.

SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 400 FROM /6,5 TO /G

INVERTER POWER SIZE				/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F PWM 5KHz	/F PWM 3KHz	/G PWM 5KHz	/G PWM 3KHz
MAX. POWERS APPLICABLE IN U- V- W OUTPUTS	LINE 230Vac		Pmotore* kW	26	32	45	52	63	76	90	121	147	170	200	228	260	288
			Smax* kVA	35	42	55	65	81	97	119	162	183	219	270	308	310	345
	LINE 400Vac		Pmotore* kW	45	55	75	90	110	132	160	220	250	315	355	400	450	500
			Smax* kVA	60	73	95	114	142	170	208	282	318	381	453	516	540	600
	LINE 690Vac		Pmotore* kW	62	75	105	135	160	200	250	345	355	-	443	500	540	600
			Smax* kVA	78	96	131	167	203	250	298	385	418	-	497	561	600	668
NOMINAL CURRENT IN L1- L2- L3 INPUTS	LINE 230-400Vac		A	87	106	138	165	205	245	300	410	460	550	655	745	780	868
	LINE 230-400Vac with reactance		A	70	82	110	135	164	200	240	325	370	460	550	627	655	730
NOMINAL CURRENT IN U- V- W OUTPUTS	LINE 230-400Vac	A	MAX IMPOSTABILE	87	106	138	165	205	245	300	410	460	550	655	746	780	868
			ASSOLUTA*	95	116	151	181	225	269	330	451	506	605	720	820	858	954
	LINE 690Vac	A	MAX IMPOSTABILE	65	80	110	140	170	210	250	330	350	-	412	470	490	560
			ASSOLUTA*	71	88	121	154	187	231	275	363	385	-	453	517	539	616
MAX. CARD BLOCK CURRENT IN U - V - W OUTPUTS			A	245	300	385	460	575	685	840	1000	1290	1540	1800		2090	
L1- L2- L3 INPUT PROTECTION FUSES gL or GG TYPE			A	100	100	125	200	250	315	400	500	630	630	1000		1250	
BRAKING CURRENT F F+ OUTPUT IN CONTINUOUS SERVICE WITH REACTANCE	LINE 230-400Vac		A	125	125	187	187	187	114	114	250	250	250	250		250	
	LINEA 690Vac		A	125	125	187	187	187	114	114	250	250	-	250		250	
MINIMUM BRAKING RESISTOR F F+ OUTPUT	LINE 230Vac		OHM	6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 400Vac		OHM	6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 690Vac		OHM	9	9	6	6	6	10	10	4,5	4,5	-	4,5		4,5	
MAX. DISSIPATED POWER (HOLDER WITH 5KHz PWM)			kW	1,4	1,5	2,0	2,0	2,5	3,5	3,5	5	6,5	8	9,5		10	
COOLING FAN				SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI		SI	
INTERNAL EMI FILTER		LINE 230-400Vac		SI	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	
		LINE 690Vac		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	
INVERTER 650KW / 400V IN CLIMATE CABINET ON REQUEST																	

*** Pmotor KW** = Maximum motor power applied to the inverter output according to 4 poles asynchronous motor standard label value. In case of a motor with different poles, check the compatibility with the inverter output maximum current (6 - 8 poles)

*** Smax KVA** = Max. applicable power with cosphi = 1

* **ABSOLUTE** = The maximum current limit in continuous service on the U-V-W output, without inverter fault.

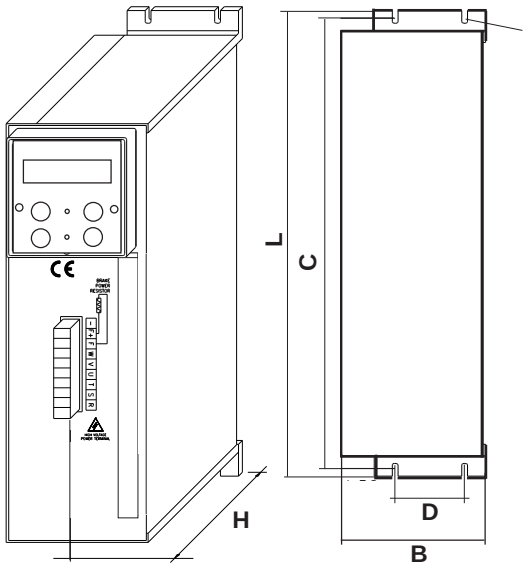
Inverter derating according to PWM frequencies

Caution !

Direct max. powers in the tables are allowed for PWM frequencies up to 5KHz. For higher frequencies the inverter must be derated following the diagrams on the right.

As for PWM frequency setup, see parameter group: 1.12.PWM GENERATOR

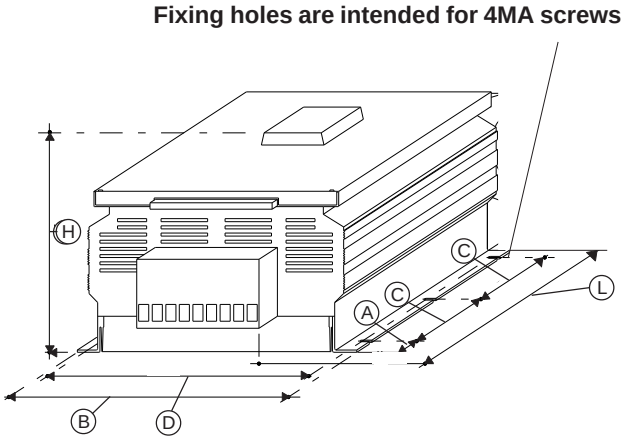
Dimensions and weights for inverters from 400/P to 400/L



All dimensions are in mm

INVERTER SIZES	H	B	L	C	D	WEIGHT (Kg)	EMI INTERNAL FILTER
/P	200	90	285	275	60	2,7	YES
/R	200	114	285	275	60	2,8	YES
/0- 0/M	200	134	365	353	60	3,5	YES
/1	200	134	365	353	60	3,6	YES
/L	200	134	365	353	60	4	YES

Dimensions and weights for inverters from 400/2 to 400/G



All dimensions are in mm

INVERTER SIZES	H	B	L	A	C*	D	WEIGHT (Kg)	EMI INTERNAL FILTER
/2	180	265	385	75	200x1	253	8	SI
/2,5 /3	200	315	430	95	200x1	305	10	SI
/3,5	280	310	420	75	235x1	295	14,5	SI
/5	280	280	515	65	233x1	265	18,5	SI
/6 /6,5	295	380	570	60	360x1	365	30	SI
/7	295	380	570	60	360x1	365	30	NO
/8	295	380	620	110	360x1	365	40	NO
/8,5	295	480	830	100	300x2	465	55	NO
/9 /A	295	480	950	100	300x2	465	80	NO
/B	295	480	1070	100	300x2	465	85	NO
/C	295	480	1270	100	450x2	465	100	NO
/D /E /F	400	680	1250	110	225x4	655	170	NO
/G	400	885	1270	110	225x4	860	200	NO

* The number of C quotes depends of the numbers of fixing holes.

- As for models from /5 to /G, a version with EXTERNAL CABINET COOLING is available on request
WARNING! The version of the inverters at 690Vac is higher than 6 cm (add 60mm to the size H)

Suggestions for a correct mechanical installation

- Make sure that the characteristics of the area in which the inverter is to be installed fall within the recommended characteristics given in Chapter 5: TECHNICAL FEATURES (temperature, humidity, protection level, altitude).

-Install the inverter in a place dedicated to the panel power parts. Avoid placing it near low voltage analog or digital boards (i.e.: opposite side of the metal sheet).

- Favour the cooling air flow as much as possible. Do not stack drives, leave a space of at least 100 mm under and above it and of at least 50 mm sideways.

- Avoid vibrations and knocks.

- Leave enough room to install anti-disturbance filters, should they be necessary.

The drive should be installed vertically with the fans in the lower part and inserted in well ventilated panels. The inverter should also be fixed to a rigid, flat surface in order to force the air that is pushed up from the ventilators through the heat dissipator. If the inverter is installed inside any kind of container, this must have air vents in the higher parts and fans with a grill in the lower part to let hot air out above the highest border of the inverter, as shown in the diagram below. The air flow coming out from the upper part of the inverter should not be obstacled in its way towards the expulsion airvents.

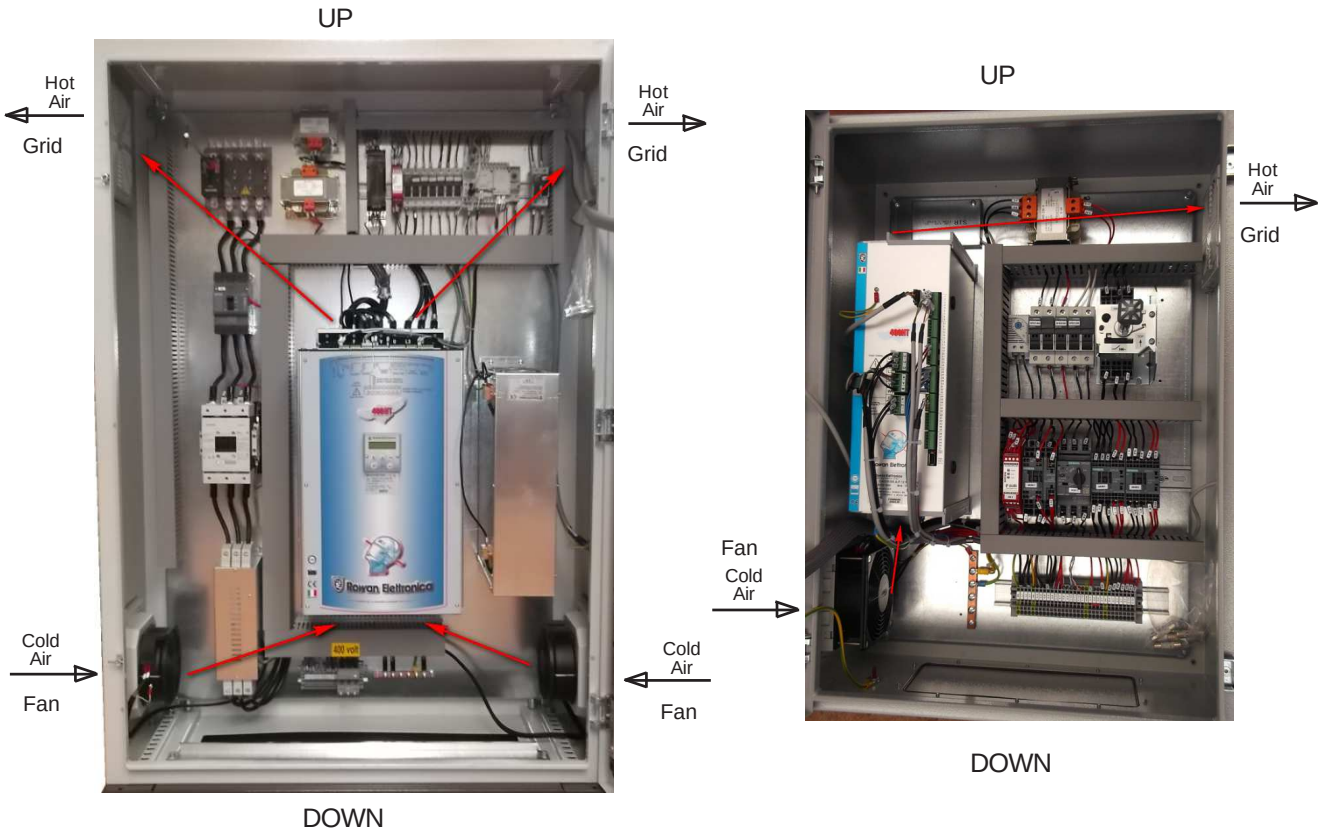
In particular aggressive areas, or if it is not possible to ventilate the panel enough, use heat exchangers or air conditioners.
For the dimensioning of the air exchange within the ELECTRICAL CABINET, takE into account the value: MAX. DISSIPATED POWER (AT 5KHz PWM) of the tables in chapter 5.
In the case of higher PWM frequencies, consequently increase in function of the diagram of derating.

Please remember that if the fault relay (Default O2) is used to block the inverter power supply in case of faults, cooling fans will be stopped as well. If Fault 14 occurs (Power module overheating cooler), the inverter should be powered, but RUN command (I1) disabled, in order to speed up dissipator cooling. In this way O2 relay won't deactivate and cooling fans will continue working.

All inverters from /5 to /G have a thermostat on the cooler activating cooling fans when the dissipator temperature goes over 50°C; fans are deactivated when the dissipator temperature is lower than 40°C.

IMPORTANT: is recommended at least once per year to control the tightening of terminal board, especially the high power one, both the inverter and the motor to avoid the possibility of looseness with consequent overheating of contact and cable connected.

HOW TO PLACE AN INVERTER IN A PANEL



General warnings before connection of the threephase power supply

TN- (Threephase + Neutral to Ground) and TT- (Threephase + Ground) network connections

Rowan inverters are designed to be powered by this kind of threephase nertworks, electrically symmetrical to Ground. The inverter must be connected to earth.

IT- (Threephase without Ground) network connections

For IT-feed, the use of a Ground trial delta/star isolation transformer is compulsory, or any isolation loss by one of the devices connected to the same network might cause inverter faults.

Wiring system and electromagnetic compatibility

The Series 400 drives have been designed to work in industrial environments in accordance with the safety standards dictated by the CEI EN 60204-1 general directive.They comply with EMC 2004/108/CE directive, with reference to the CEI EN 61800-3 (Cat. C2). In order to meet these requirements drives **without internal filter** must be connected via anti E.M.I. filtering device (Electro Magnetic Interference) as indicated in the connection diagram given below, made up of a threephase supply filter. To chose the suitable filter see:

“Table of threephase anti E.M.I. filters and ferrite toroids for different inverters”

-The U- V- W wires **must** also be passed through a ferrite ring several times, which should be positioned as close as possible to the drive.

During the wiring phase, the following rules must be respected:

- **It is compulsory** not to pass the command terminal board connecting wires through the same channel as the power wires of the same drive or of other device (keep a distance of at least 30 cm between them).

- **It is compulsory** to connect braided wire analog inputs/outputs through and place it in a **different** channel from the one used for power cables.

- **It is compulsory** to connect the encoder (LINE DRIVER) from the motor to the drive by a 6-wires braided cable. The 6 wires must be connected to the inverter terminal board as indicated in the connection diagrams in this manual.

Caution !

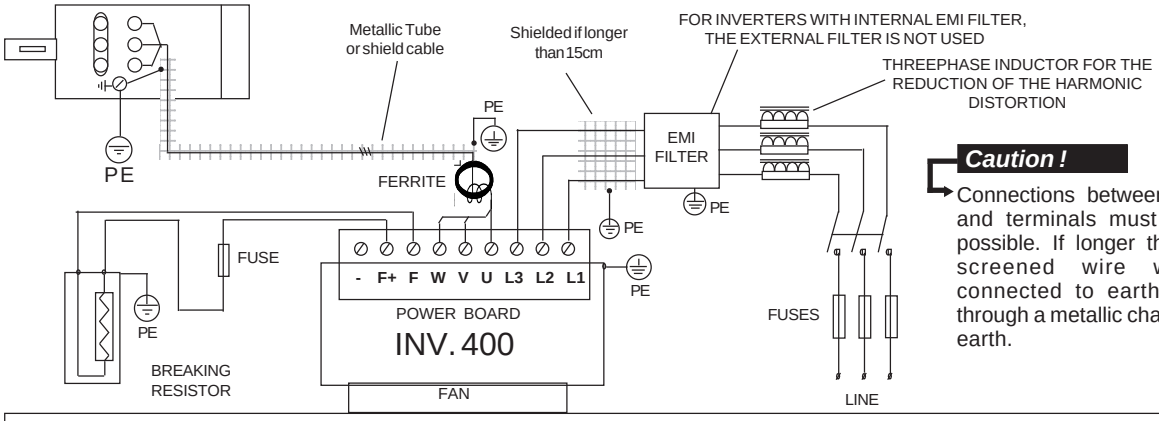
the cable shield used must be connected both at pin nr. 7 (D) of the encoder connector and at the inverter common ground point (with ground bar or galvanized plate, using clamps). Avoid the shield stretch through use of wires, otherwise reduce as a possible the length.

The encoder connection cable must pass through a **different** channel from that of the power wires of the same drive or of other device. Moreover:

- **It is compulsory** to connect the end of each shield one by one to the common mass point of the panel. Avoid mass rings.

-The motor power connection **must** be performed by means of a braided cable or by wires inserted into a metallic tube without continuity solution.

Install a filter for riducing of the harmonic distorsion between the line and the EMI filter.



Caution !

Connections between L1-L2-L3 filters and terminals must be as short as possible. If longer than 15cm, use a screened wire with screening connected to earth, or pass wires through a metallic channel connected to earth.

Inverters with inner EMI filter have capacitors connected between the phases and the metal case; for safety it is **absolutely forbidden** supplying the inverters if their PE terminal is not connected to ground. For the same reason it is **absolutely forbidden** supplying external EMI filter if their PE terminal is not connected to ground.

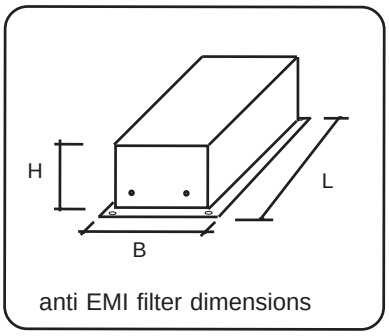
Caution !

- E.M.I. filters and inverters with inner filter must be used with power supply directed to ground (TN or TT).
- Before connecting the inverter and/or the EMI filter, check the correct state of the earth grounding system. Any bad ground connection can affect the right functioning of the filter and damage it.
- If two phases cut off, the leakage current can reach 6 times the values we have in normal conditions.
- Take note that the standard EN50178 specifies that, in presence of leakage currents to ground greater than 3,5mA, the ground connection cable must be of a fix type and doubled for redundancy.
- The maximum protection and the good functioning of the inverter is obtained only by using type B differentials with intervention threshold not lower than 300mA.

Caution ! In a domestic environment this product can cause radio interferences, in that case the user should use adequate precautions.

Table of threephase anti E.M.I. filters electrical features and dimensions

EMC FILTER CODE (LINE 230-400VAC)	I_{MAX} FILTER (Arms)	FILTER DIMENSIONS (mm)			WEIGHT (Kg)
		H	B	L	
FT.ROW10A.400	10	55	106	116	1
FT.ROW25A.400	25	60	135	232	2,5
FT.ROW50A.400	50	85	122	250	3
FT.ROW130A.400	130	150	90	270	3
FT.ROW200A.400	200	125	225	440	6
FT.ROW300A.400	400	125	225	440	6,5
FT.ROW600A.400	600	200	385	640	18
FT.ROW850A.400	850	200	385	640	19



anti EMI filter dimensions

Table of threephase anti E.M.I. filters and ferrite toroids for different inverters

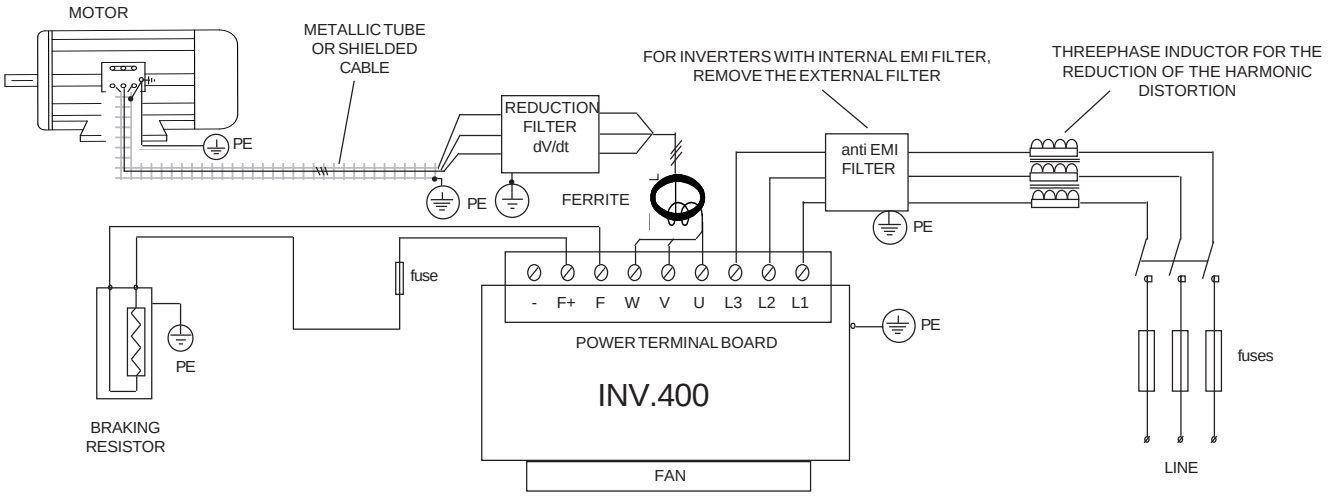
INV.400 POWER SIZE LINE 230VAC-400VAC	CODE EMC FILTER	I_{MAX} FILTER (Arms)	FILTER LEAKAGE CURRENT (1) [mA]	INVERTER OUTPUT WIRES SECTION (mm^2)	PASS NR THROUGH THE TOROID	TOROID NR	TOROIDS CODE
/P	INTERNAL FILTER	/	3,5	1	3	1	NUFT19
/R	INTERNAL FILTER	/	3,5	1	3	1	NUFT19
/0	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/0M	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/1	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/L	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/2	INTERNAL FILTER	/	3,5	4	3	1	NUFT38
/3	INTERNAL FILTER	/	3,5	6	3	1	NUFT38
/3,5	INTERNAL FILTER	/	3,5	10	3	1	NUFT38
/5	INTERNAL FILTER	/	38	16	3	1	NUFT38
/6	INTERNAL FILTER	/	38	16	3	1	NUFT38
/6,5	INTERNAL FILTER	/	38	25	2	2	NUFT38
/7	FT.ROW130A.400	130	18	35	2	2	NUFT38
/8	FT.ROW200A.400	200	18	50	1	2	NUFT38
/8,5	FT.ROW200A.400	200	18	70	1	2	NUFT38
/9	FT.ROW200A.400	200	18	95	1	2	NUFT38
/A	FT.ROW400A.400	400	18	* 2x50 x phase	1	1	NUFT104
/B	FT.ROW400A.400	400	18	* 2x70 x phase	1	1	NUFT104
/C	FT.ROW400A.400	400	18	* 2x95 x phase	1	1	NUFT104
/D	FT.ROW600A.400	600	18	* 2x120 x phase	1	1	NUFT104
/E	FT.ROW600A.400	600	18	* 3x95 x phase	1	2	NUFT104
/F	FT.ROW850A.400	850	18	* 4x95 x phase	1	2	NUFT104
/G	FT.ROW850A.400	850	18	* 4x120 x phase	1	3	NUFT104

(1) This is the EMI filters (inner or external) maximum leakage current to ground in normal and good functioning conditions (460V/50Hz).
ATTENTION: If two phases cut off, the leakage current can reach 6 times the values we have in normal conditions.
* If there are connections with several cables of high section, ROWAN EL. can supply terminals useful to simplify the connection (ask Rowan Elettronica Techn.Dept.).
Filters characteristics for line 690VAC can be supplied by Rowan Elettronica Techn. Dept.

Reducing the harmonic distortion

Inverters cause current harmonic distorsion; the user shall value if the environment or the plant where the inverter is installed needs a reduction of the harmonic distortion as per standards CEI EN 61000-3-2 (In<=16A, directly connected to the public network at low voltage) and CEI EN 61000-3-12 (16A<In<=75A, directly connected to the public network at low voltage); in this case Rowan Elettronica supplies, on request, filters for reduction of the harmonic distorsion as written on the following table.

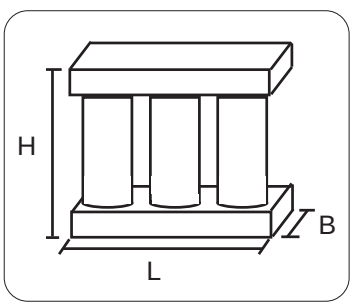
Connection of the filter for the reduction of the harmonic distorsion:



As well as reducing the harmonic distortion, this inductor reduces the effective current absorbed by the inverter and gives also better drive protection against possible power losses and peaks coming from the supply line. In particular, it reduces those current peaks crossing the condensers inside the inverter, which helps them lasting longer.

Table of filters for reducing the harmonic distortion for different inverters

FILTER CODE (case)	MAX CURRENT (A)	DISSIPATED POWER at In (W)	MAX DIMENSIONS AND WEIGHTS				INV.400 POWER SIZE LINE 230-400V	INV.400 POWER SIZE LINE 690V
			L (mm)	B (mm)	H (mm)	WEIGHTS (KG)		
RTZ.5A.5,6	5	16	120	66	115	3	/P /R	-
RTZ.12A.2,2	12	27	150	90	147	6	/0 /1	-
RZT.22A.1,3	22	42	180	89	147	7	/L /2	-
RZT.35A.0,76	35	65	180	100	175	9	/3	-
RZT.50A.0,56	50	87	180	110	175	10,5	/3,5	/5 /6
RZT.72A.0,39	72	123	240	110	242	14,2	/5 /6	/6,5 /7
RZT.106A.0,26	106	195	240	120	242	17,5	/6,5 /7	/8
RZT.165A.0,16	165	187	240	145	242	24,8	/8 /8,5	/8,5 /9
RZT.245A.0,11	245	225	300	130	260	27	/9 /A	/A /B
RZT.370A.0,074	370	285	300	150	320	39	/B /C	/C /D
RZT.460A.0,059	460	438	360	165	370	54	/D	-
RZT.550A.0,049	550	465	360	200	370	69	/E	/F
RZT.655A.0,042	655	500	360	210	370	84	/F	/G



Max. dimensions of filter for reducing the harmonic distortion

Reducing dV/dT ripples to the motor

The voltage supplied the motor connected to the inverter is obtained using the PWM (Pulse With Modulation) technique, which means that it is formed by a sequence of variable duration pulses. The high increasing speed of the voltage of these pulses (dV/dt) can cause high dispersion currents through the motor supply cables, as well as between the motor winding themselves, and also between the motor windings and the motor body. A high Dv/dt also determines very high voltage paeks on the motor windings, through the intrinsic inductance of the connecting wires.

In order to reduce all problems arising from the presence of dispersion currents and high overvoltage on the windings, a range of filters reducing the dV/dt has been produced. Their related codes, power sizes and dimensions are given in the following table:

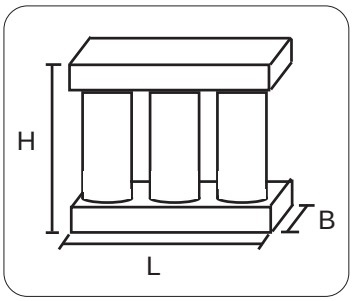
dV/dt reduction filter table for different inverters

FILTER CODE	MAX CURRENT (A)	DISSIPATED POWER at In (W)	MAX DIMENSIONS				INV.400 POWER SIZE LINE 230-400V	INV.400 POWER SIZE LINE 690V
			L (mm)	B (mm)	H (mm)	PESO (KG)		
FIT.DV/DT.25A	25	27	150	82	147	3,6	/P.../2	-
FIT.DV/DT.80A	80	62	180	130	175	8,6	/3.../6	/5.../7
FIT.DV/DT.120A	120	78	180	160	170	10,9	6,5 /7	/8
FIT.DV/DT.200A	200	156	240	140	230	14,6	/8 /8,5	/8,5 /9
FIT.DV/DT.300A	300	195	240	165	225	21,5	/9.../B	/A /B
FIT.DV/DT.400A	400	215	300	155	280	26	/C	-
FIT.DV/DT.500A	500	270	300	175	280	38	/D	/C /D
FIT.DV/DT.600A	600	382	300	200	280	48	/E	/F /G
FIT.DV/DT.750A	750	430	360	195	330	53,5	/F	-

The filters for dV/dt reducing should always be used if the winding insulation level of the motor is not known, or else with motors that were not purposely manufactured to be connected to an inverter.

These filters should also be used each time wires between the inverter and the motor are longer than 15m.

The dV/dt reducing filter should be positioned between the ferrite toroid and the motor next to this toroid, as shown in the diagram on the previous page.



Max. dV/dt reduction filters dimensions

Electrostatic discharges (ESD)

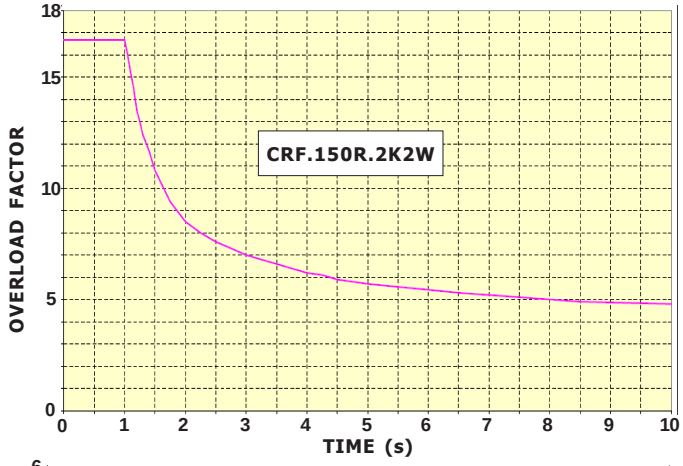
The inverter contains some components that may be harmed by electrostatic discharges (ESD). For that reason it is important to follow the present advises:

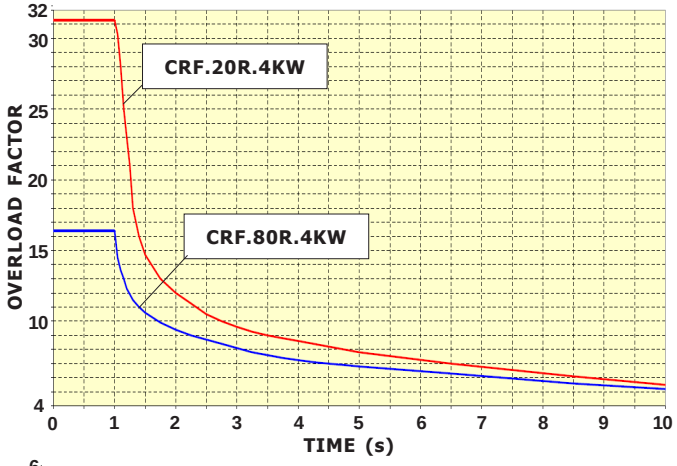
- touch the internal cards only when strictly necessary.
- before handling the cards, provide for discharging yourself electrostatically .
- the cards have not to be touched by very insulating materials (for ex. textile fibers) especially when they are running.

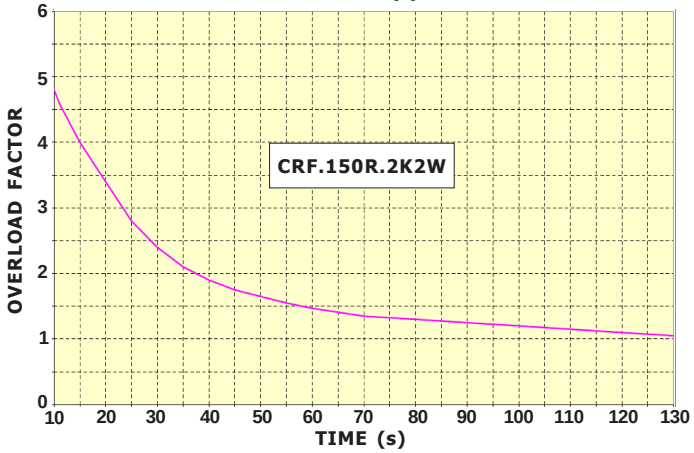
Table of braking resistors for Rowan inverters

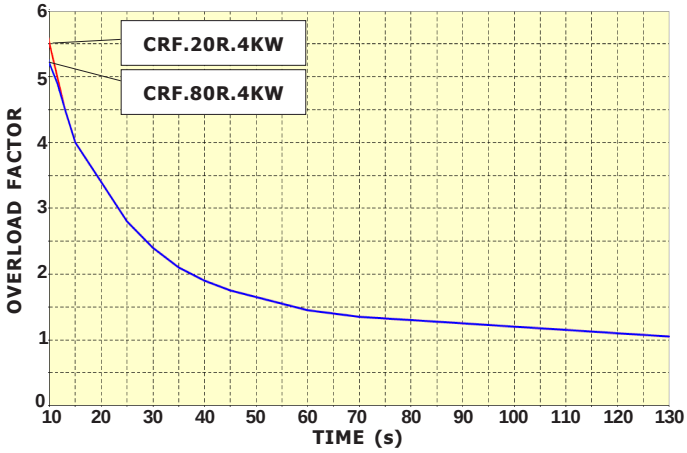
DATA	units	RES.180R. 600	CRF.150R. 2K2	CRF.20R. 2K5	CRF.30R. 2K5	CRF.40R. 2K5	CRF. 20R. 4KW	CRF. 80R. 4KW
NOMINAL POWER	W	600	2200	2500	2500	2500	4000	4000
RESISTOR	ohm	180	150	20	20	40	20	80
NOMINAL CURRENT	A	1.8	3.8	11	9	7.9	14.1	7.0
MAX CURRENT FOR 5 sec	A	2.5 (5s ON - 25s OFF)	9.2 (5s ON - 30min OFF)	16.7 (5s ON - 1min OFF)	12.9 (5s ON - 1min OFF)	10.6 (5s ON - 1min OFF)	39.5 (5s ON - 30min OFF)	18.0 (5s ON - 30min OFF)
FUSE TYPE gL	A	2	4	16	10	10	16	8

To facilitate the choice of the type of resistance CRF (and any combinations series / parallel) as a function of the working cycle, are depicted below the curves of overload. WARNING! The curves refer to a single overload with a maximum ambient temperature of 40 ° C and a resistor installed in a location where it is ensured proper air circulation. The average time that the resistor employ to move back to the ambient temperature is between 20 and 30 minutes, depending on the cooling conditions.









There may be 2 typical cases of installation for braking resistors:

Installation in a cabinet

This kind of installation is generally used in case of intermittant use of the resistors, with high, but distanced current peaks, in order for cabinet and other devices temperatures not to increase too much over their continuous duty cycle limits. In this case, current and power nominal values must be applied, but with **5% duty cycle**.

- **RES.180R.600** and **RES.xxR.2K5** resistors, made of ceramics and protected by an ultra slim covering, must be fixed in close contact with the panel components supporting sheet.

- **RES.CRF.xxR.xKxW** resistors, closed in a IP22 panel without ventilation, must be mounted vertically as shown in the drawings of the page on the right.

External installation

This kind of installation is used when it is neccessary to dissipate in countinuos duty cycle as much power as possible of the brake resistor, with or without ventilation. The current and power in duty cycle 100% characteristics shown in the table are related to the following mounting conditions:

- **RES.180R.600** and **RES.xxR.2K5** resistors must be fixed onto a cooler, which is able to discharge **0,5W/°C**.

Caution! with this features, the flat resisitor external temperature may reach about **300°C**.

Arrange for proper protections against accidental contacts.

Non ventilated resistors in IP22 cabinet **CRF.xxR.xKxW**, and ventilated **CRF.xxR.xKxW.V** must be mounted in vertical position as indicated in diagrams on the facing page.

Caution! with this features, the temperature of the air coming out from the container slits may reach about **400°C**.

Arrange for proper protections against accidental contacts.

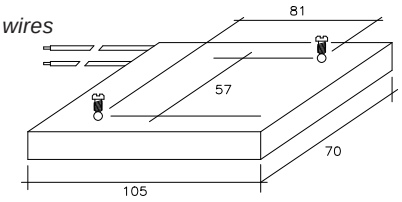
Caution! the ohmic value of the braking resistor can't be lower than that estimated in: **"OUTPUT F F+MIN. BRAKING RESISTOR"** tables of Chapter 5: TECHNICAL FEATURES.
In inverter from /3 size up to /F size, the output for connecting the braking resistance (F and F+) is protected against the short circuit (indicated by the inverter blockage with FAULT13). In sizes from /P up to /2 there is no protection, therefore we suggest using a protection fuse.

For safety reasons, insert a protection fuse as shown in the table.

RES.180R.600 and REA.xxR.2K5 braking resistors dimensions

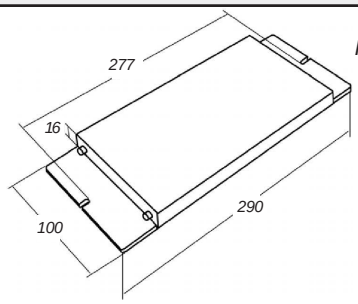
RES.180R.600

Connection wires



Dimensions in mm

RES.xxR.2K5



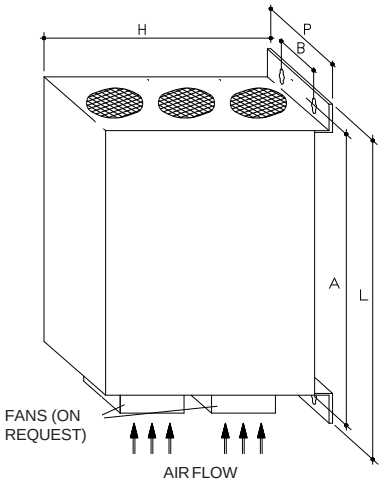
Braking resistors in CRF.xxR.xKxW container dimensions

Resistance value

Power

REISITOR CODE	H	B	L	A	P	WEIGHT (Kg)
CRF.150R.2K2W	322	67	486	458	120	7
CRF.20R.4KW	322	67	486	458	120	7,5
CRF.80R.4KW	322	67	486	458	120	7,5

Dimensions in mm



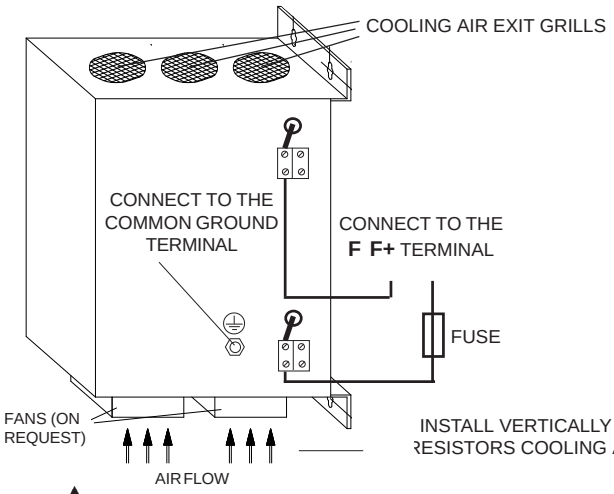
Available versions:

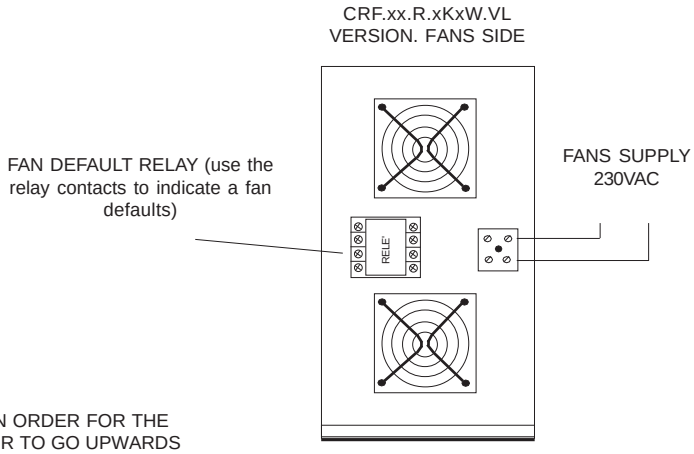
C R F. x x R . x K x W: Standard version without ventilation

C R F. x x R . x K x W.V: Standard version with ventilation

C R F. x x R . x K x W.VL: Standard version with ventilation with fan fault relay

CRF.xxR.xKxW resistors mechanical installation and electrical connection





If the container must be opened for maintenance, it is compulsory to power the inverter off and wait for at least 5 minutes before touching the electric resistor

Inverter setup for dynamic braking

In order to enable dynamic braking it is necessary to set par.1.13.1 ENABLE=YES. The inverter is equipped with an electronic control to the braking resisitor overload; so it is important to set the data on the resistor plate in the following parameters:

-In **par.1.13.2 BRAKE RESISITANCE**, set the resistor ohmic value. In case of parallel or series connection of resistors with common features, set the equivalent resistivity value.

-In **par.1.13.3 NOMINAL CURRENT**, set the resisitor nominal current at the chosen working conditions. In case of parallel connection of resistors with common features, set the current sum; in case of series connection, set the current of each resisitor. If this values is surpassed, the inverter blocks itself and FAULT 18 is displayed.

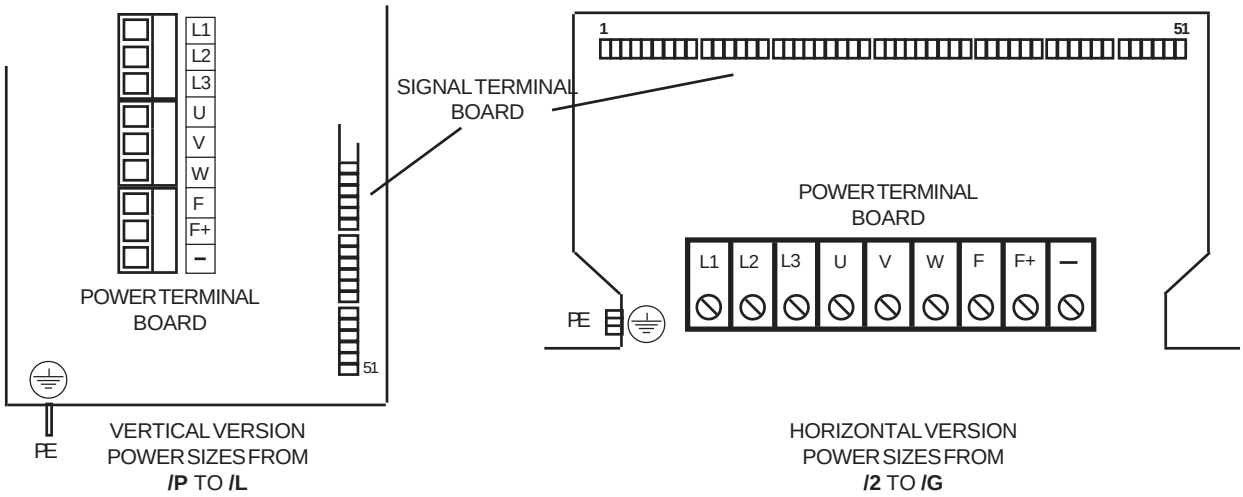
-In par.**1.13.4 5 SEC CURRENT**, insert the max. current value for 5sec. In case of parallel connection of resistors with common features, set the current sum; in case of series connection, set the current of each resisitor.

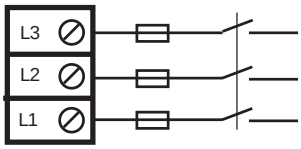
If this values is surpassed, the inverter blocks itself and FAULT 19 is displayed.

As for Rowan braking resistors, draw the data from the table on the previous page:

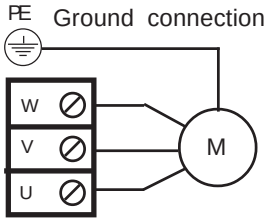
“Table of braking resistors for Rowan inverters”. In case of parallel connection of resistors, the protection fuses in the table must be set in series for each resistor.

Power terminal board description

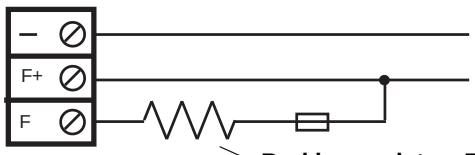




THREEPHASE FEEDING.
For protection fuses values, see the “Electric and power characteristics summary tables for the inverter Series 400” in Chapter 5: TECHINCAL FEATURES.



Threephase asynchronous motor connection

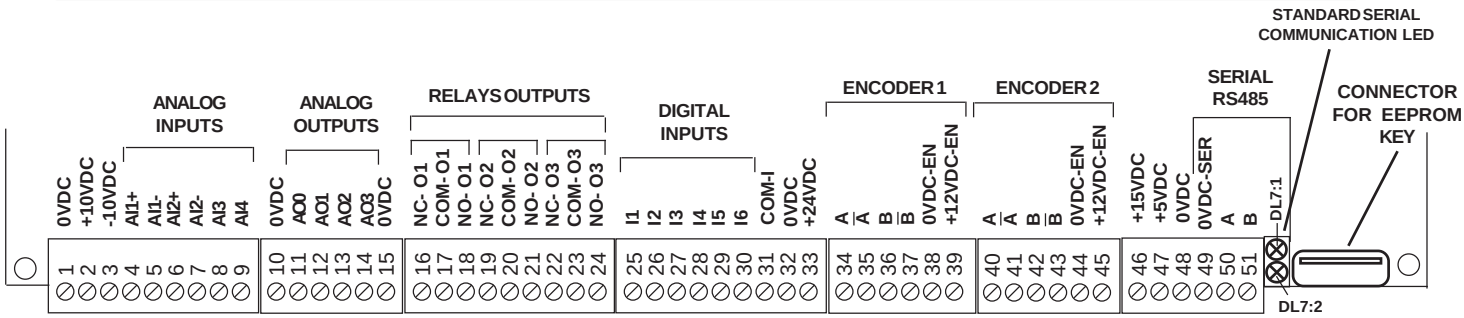


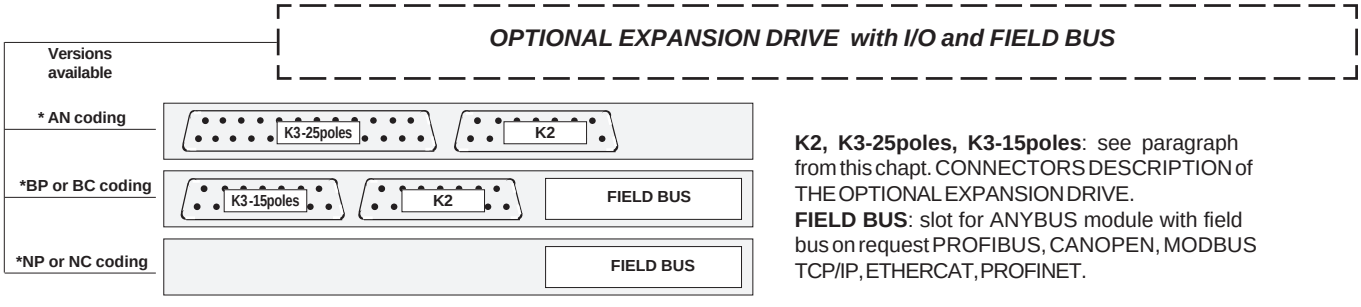
busdc negative
busdc positive

Useful connections for BUS DC common to other inverters (through suitable protection fuse).

Braking resistor. For the protection fuse value, see the tables in Chapter 8: BRAKING RESISTORS.

Terminal boards and signal connectors description





*see chapt.18 DRIVES CODING

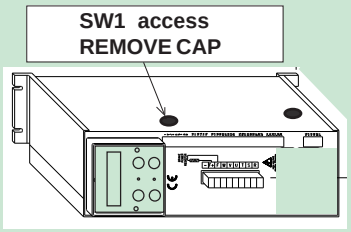
K2, K3-25poles, K3-15poles: see paragraph from this chapt. CONNECTORS DESCRIPTION of THE OPTIONAL EXPANSION DRIVE.
FIELD BUS: slot for ANYBUS module with field bus on request PROFIBUS, CANOPEN, MODBUS TCP/IP, ETHERCAT, PROFINET.

0VDC	1	Common Negative
+10VDC	2	Voltage reference for external potentiometers +10Vdc/10mA
-10VDC	3	Voltage reference for external potentiometers -10Vdc/10mA
AI1+	4	**10Vdc differential** analog input, programmable, 14 bit resolution.
AI1-	5	Default setup: 0/+10VDC input (**par. 4.3.1.3 TYPE INPUT= 0/+10V**) Default function: SPEED REFERENCE (**par. 3.1.1.1 SPEED SOURCE= AI1**)
AI2+	6	+/-**10Vdc, 0-20mA, 4-20mA differential** analog input, programmable, 12 bit resolution.
AI2-	7	Default setup: 4-20mA input (**par. 4.3.2.3 TYPE INPUT= 4/20mA**) Default function: NONE

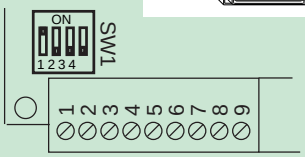
It is possible to set AI2 input for a 0Vdc/+10Vdc or +/-10Vdc voltage input; in order to do so, it is necessary to set SW1 (1, 2, 3) microswitches which are inner the inverter. The standard setup is for 0-20mA, 4-20mAinput, with micro 1 ON, micro 2 OFF, micro 3 OFF.

To change the input setup, you must follow the instructions below:

- Remove the drive covering for inverters /2 - /G,
  remove the cap as shown in the pitcure for /P - /L sizes.



- Set micro 1 OFF, micro 2 ON, micro 3 ON.
- Set **par. 4.3.2.3 TYPE INPUT= 0/+10V**, if you have a 0Vdc/+10Vdc signal.
- Set **par. 4.3.2.3 TYPE INPUT= -10/+10V**, if you have a -10Vdc/+10Vdc signal.
- Set the offset again following **par. 4.3.2.2 OFFSET** and the full-scale range following **par. 4.3.2.1 SCALE**, for the correct setup.



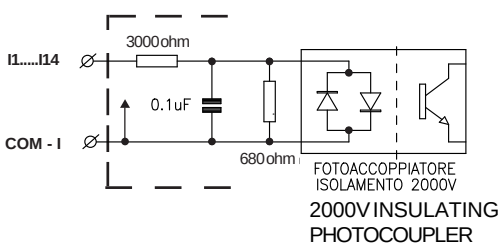
Leave out the cover form the inverter just in case of lack of supply and only when the continuos voltage between terminal (F+) and terminal (-) is lower than 50Vdc.

Before handling the card, provide for discharging yourself electrostatically; a lot of components may be damaged by electrostatic discharges (ESD).
Select only the microswitches and avoid touching all other components.

0VDC	1	**+/-10Vdc non differential** analog input, programmable, 12 bit resolution.
AI3	8	Default setup: 0/+10VDC input (**par. 4.3.3.3 TYPE INPUT= 0/+10V**) Default function: TORQUE REFERENCE (**par. 1.10.2 TORQUE SOURCE=AI3**) enabled in case of vector control.
0VDC	1	**+/-10Vdc non differential** analog input, programmable, 12 bit resolution.
AI4	9	Default setup: 0/+10VDC input (**par. 4.3.3.3 TYPE INPUT= 0/+10V**) Default function: NONE
0VDC	10	Common negative
0VDC	10	**+/-10Vdc** analog output, programmable, 12 bit resolution.
AO0	11	Default setup: +/- 10VDC output (**par. 4.4.2.4 TYPE OUTPUT= DIRECT**) Default function: MOTOR CURRENT (**par. 4.4.2.1 VAR DISPLAY=1**)
0VDC	10	**+/-10Vdc** analog output, programmable, 12 bit resolution.
AO1	12	Default setup: +/- 10VDC output (**par. 4.4.2.4 TYPE OUTPUT= DIRECT**) Default function: MOTOR CURRENT (**par. 4.4.2.1 VAR DISPLAY=3**)
0VDC	15	**+/-10Vdc** analog output, programmable, 8 bit resolution.
AO2	13	Default setup: +/- 10VDC output (**par. 4.4.4.4 TYPE OUTPUT= DIRECT**) Default function: MOTOR SPEED (**par. 4.4.4.1 VAR DISPLAY =*3***)
0VDC	15	**+/-10Vdc** analog output, programmable, 8 bit resolution.
AO3	14	Default setup: +/- 10VDC output (**par. 4.4.5.4 TYPE OUTPUT= DIRECT**) Default function: MOTOR TORQUE (**par. 4.4.5.1 VAR DISPLAY= 5**)
0VDC	15	Common negative

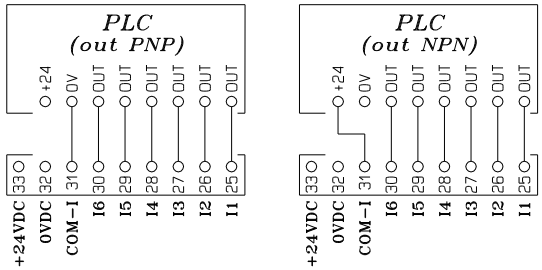
NC- O1	16	**O1 relay** programmable digital output contact. Contact current-carrying capacity 0,5A-120Vac/ 2A-30Vdc. Default function: MOTOR SPEED THRESHOLD (0 RELAY) (**par. 3.1.3.3 OUT THRESHOLD1= O1**) Relay ON with motor speed over the threshold in **par. 3.1.3.1 SPEED THRESHOLD1** Relay OFF with motor speed under the threshold in **par. 3.1.3.1 SPEED THRESHOLD1**
COM - O1	17	
NO - O1	18	
NC- O2	19	**O2 relay** programmable digital output contact. Contact current-carrying capacity 0,5A-120Vac/ 2A-30Vdc. Default function:INVERTER IN FAULT (**par. 1.9.5 OUT FAULT= O2**) Relay ON for normal functioning, OFF for inverter in fault. **When feeding the inverter, the relay displays OFF for about 5sec, then it displays OFF in absence of FAULTS**
COM - O2	20	
NO - O2	21	
NC- O3	22	**O2 relay** programmable digital output contact. Contact current-carrying capacity 0,5A-120Vac/ 2A-30Vdc Default function: INVERTER RUN (**par. 1.9.4 OUT RUN= O3**) Relay ON for running inverter, OFF for inverter in OFF running or in fault.
COM - O3	23	
NO - O3	24	
I1	25	Non-programmable digital input with inverter RUN fixed function. **Even if this input is already active, the inverter starts running about 6 sec after its power on.**
I2	26	Programmable digital input Default function: STOP IN RAMP (**par. 3.1.1.2 IN STOP SPEED= I2**) Input OFF, the motor accelerates in ramp to reach the set speed. Input ON, the motor decelerates in ramp and then it keeps the stop position.
I3	27	Programmable digital input Default function: FIXED SPEEDS ACTIVATION (**par. 3.1.6.8 IN1 SPEED= I3**) For speeds activation, see Chapter 10: PARAMETERS AND VISUALIZATIONS, par. MENU PARAMETERS DESCRIPTION: **3.1.6 FIXED SPEED**
I4	28	Programmable digital input Default function: FIXED SPEEDS ACTIVATION (**par. 3.1.6.9 IN2 SPEED= I4**) For speeds activation, see Chapter 10: PARAMETERS AND VISUALIZATIONS, par. MENU PARAMETERS DESCRIPTION: **3.1.6 FIXED SPEED**
I5	29	Programmable digital input. Default function: FIXED 1 ACC. RAMP ACTIVATION (**par. 3.1.7.4 IN1 ACC= I5**) For fixed ramps activation, see Chapter 10: PARAMETERS AND VISUALIZATIONS, par. MENU PARAMETERS DESCRIPTION: **3.1.7 FIXED ACC. RAM**
I6	30	Programmable digital input Default function: FIXED 1 DEC. RAMP ACTIVATION (**par. 3.1.8.4 IN1 DEC= I6**) For fixed ramps activation, see Chapter 10: PARAMETERS AND VISUALIZATIONS, par. MENU PARAMETERS DESCRIPTION: **3.1.8 FIXED DEC. RAMPS**
COM-I	31	Digital inputs polarisation terminal Connect to positive if the inputs are to be connected with **NPN** logic Connect to negative if the inputs are to be connected with **PNP** logic
OVDC	32	Common negative
+24VDC	33	Positive digital inputs polarisation, +24Vdc/250mA Protected by an auto-restore fuse operating at 650mA.

Electric drawing: inside of the digital input from Ito I4



2000V INSULATING PHOTOCOUPLER

Connection example: digital inputs with external logics (PLC type)



A	34	A channel
$\overline{A}$	35	Negative A channel
B	36	B channel
$\overline{B}$	37	Negative B channel
OVDC-EN	38	Negative encoder supply
+12VDC-EN	39	Positive encoder supply, 12Vdc/200mA (5Vdc on request).Protected against short circuit by an auto restore fuse operating at 250mA

ENCODER 1 CONNECTION
Encoder mounted on the motor, in default setting for vector control.
LINE DRIVER type

A	40	A channel
$\overline{A}$	41	Negative A channel
B	42	B channel
$\overline{B}$	43	Negative B channel
OVDC-EN	44	Negative encoder supply
+12VDC-EN	45	Positive encoder supply, 12Vdc/200mA (5Vdc on request).Protected against short circuit by an auto restore fuse operating at 250mA

ENCODER 2 CONNECTION.
LINE DRIVER type

Caution!

The full load on the positive supply of the encoders (terminals 39, 45 and pin 11 of K2 connector) must never exceed 200mA.

The default encoder power supply is +12Vdc, on requeste +5Vdc.
The default encoder input signal is +12Vdc, on request +5Vdc or +24Vdc.

In case of vectorial control, it is possible to setup manually or by a non programmed digital input, the feedback by ENCODER 1 or by ENCODER 2; this function can be set in **1.6.7 IN ENABLE ENC 2.** (See Chapter 10: PARAMETERS AND VISUALISATIONS, paragraph MENU PARAMETERS DESCRIPTION **1.6 ENCODER VECTOR**)

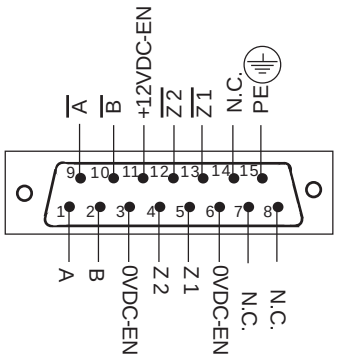
+15VDC	46	+15Vdc/200mA power supply for signal transducers
0VDC	48	Protected against short circuit by an auto-restore fuse operating at 250mA
+5VDC	47	+5Vdc/200mA power supply for signal transducers
0VDC	48	Protected against short circuit by an auto-restore fuse operating at 250mA
0VDC-SER	49	Serial RS485 common negative
A	50	Channel A serial line
B	51	Channel B serial line

RS485 SERIAL LINE CONNECTION ACCORDING TO MODBUS RTU. ROWAN standards. For the activation, see the menu parameters **5. SERIAL COMUNIC.** and its related "INSTRUCTION MANUAL FOR INVERTER 400 SERIAL CONNECTION"

USB CONNECTOR  USB CONNECTOR FOR PARAMETERS BIDIRECTIONAL TRANSFER FROM THE EEPROM KEY TO THE INVERTER AND VICEVERSA (See **Chapter 11: PARAMETER TRANSFER**)

Optional B404S.A card-edge connectors description

CONNECTOR K2 (ZEROS / ENCODER 3)



A	A channel	ENCODER 3 CONNECTION LINE DRIVER type
$\overline{A}$	Negative A channel	
B	B channel	
$\overline{B}$	Negative B channel	
Z 2	Z channel	ZERO ENCODER 2 OR PHASE SENSOR 2
$\overline{Z2}$	Negative Z channel	
Z 1	Z channel	ZERO ENCODER 2 OR PHASE SENSOR 2
$\overline{Z1}$	Negative Z channel	

0VDC-EN Encoders/sensors common negative

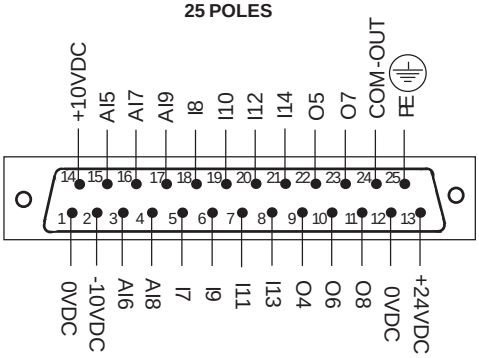
0VDC-EN Encoders/sensors common negative

+12VDC-EN Encoders/sensors supply positive 12Vdc (5Vdc on request).
Protected against short circuit by an auto-restore fuse operating at 250mA

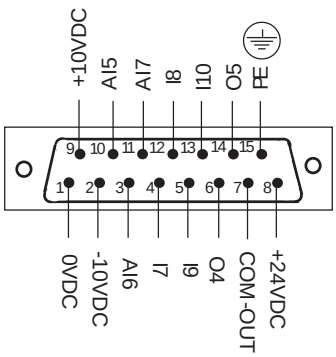
PE Screened wire connection; the terminal is connected internally to the PE common mass point

N.C. Non connected pin

K3 CONNECTOR I/O EXPANSION 25 POLES



K3 CONNECTOR I/O EXPANSION 15 POLES



0VDC Common negative

0VDC Common negative

+24VDC Positive digital inputs/outputs polarisation, +24VDC/500mA
Protected by an auto-restore fuse operating at 650mA

+10VDC Voltage reference for external potentiometers +10Vdc/10mA

-10VDC Voltage reference for external potentiometers -10Vdc/10mA

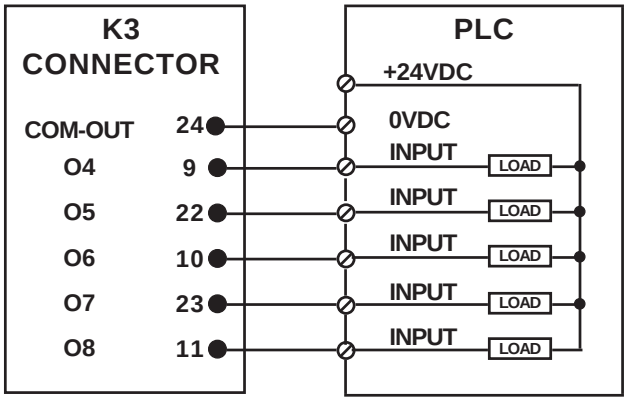
AI5	**15** ●	**+/-10Vdc non differential** analog input, programmable, 10 bit resolution. Default setup: 0/+10VDC input (**par. 4.3.5.3 TYPE INPUT= 0/+10V**) Default function: NONE
AI6	**3** ●	**0/+10Vdc non differential** analog input, programmable, 10 bit resolution. Default function: NONE
AI7	**16** ●	**0/+10Vdc non differential** analog input, programmable, 10 bit resolution. Default function: NONE
AI8	**4** ●	**0/+10Vdc non differential** analog input, programmable, 10 bit resolution. Default function: NONE
AI9	**17** ●	**0/+10Vdc non differential** analog input, programmable, 10 bit resolution. Default function: NONE
I7	**5** ●	Programmable digital input. Default function: NONE
I8	**18** ●	Programmable digital input. Default function: NONE
I9	**6** ●	Programmable digital input. Default function: NONE
I10	**19** ●	Programmable digital input. Default function: NONE
I11	**7** ●	Programmable digital input. Default function: NONE
I12	**20** ●	Programmable digital input. Default function: NONE
I13	**8** ●	Programmable digital input. Default function: NONE
I14	**21** ●	Programmable digital input. Default function: NONE

Caution !

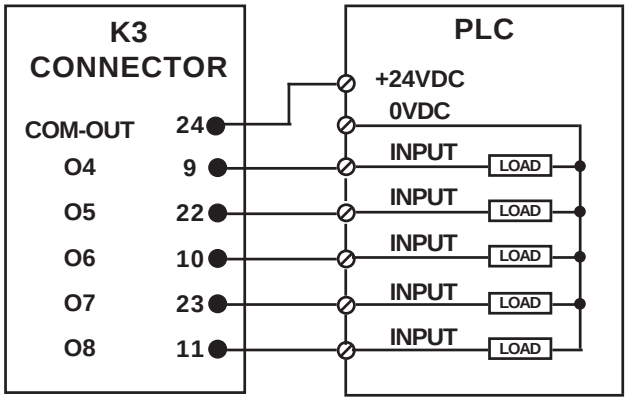
The internal electric diagram and the I7- I14 digital inputs polarisation (by 31 COM-I terminal) are the same as those described for I1- I6 standard inputs.

O4	**9** ●	Programmable digital output, NPN/PNP, max. 100VDC/80mA. Default function: NONE
O5	**22** ●	Programmable digital output, NPN/PNP, max. 100VDC/80mA. Default function: NONE
O6	**10** ●	Programmable digital output, NPN/PNP, max. 100VDC/80mA. Default function: NONE
O7	**23** ●	Programmable digital output, NPN/PNP, max. 100VDC/80mA. Default function: NONE
O8	**11** ●	Programmable digital output, NPN/PNP, max. 100VDC/80mA. Default function: NONE
COM-OUT	**24** ●	Digital outputs polarisation terminal Connect to positive if the outputs are to be connected with **PNP** logic Connect to negative if the outputs are to be connected with **NPN** logic
⏚ **PE**	**25** ●	Screened wire connection; the terminal is connected internally to the PE common earth point

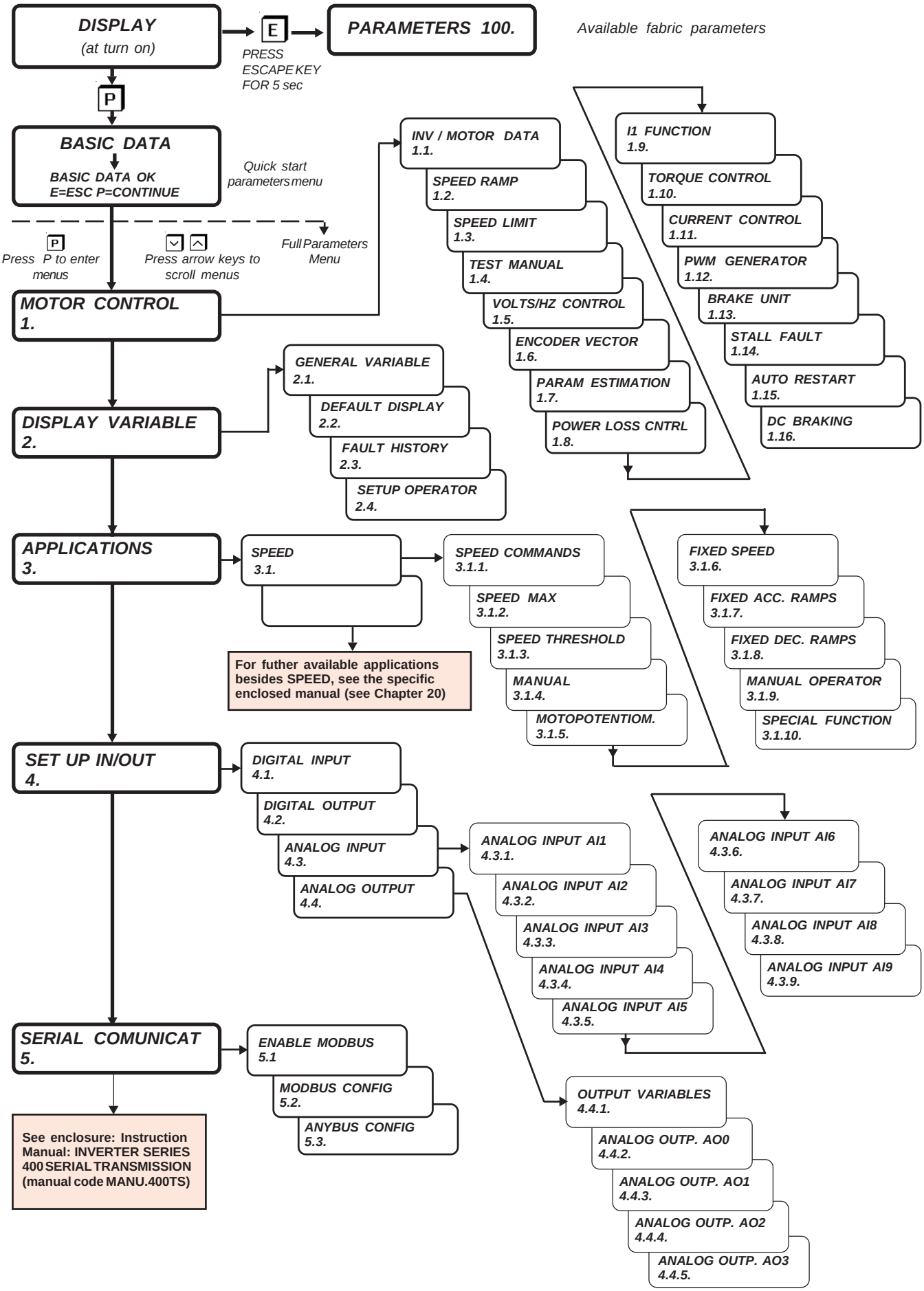
Connection example:
digital outputs with PNP input logic



Connection example:
digital outputs with NPN input logic



Menus complete structure

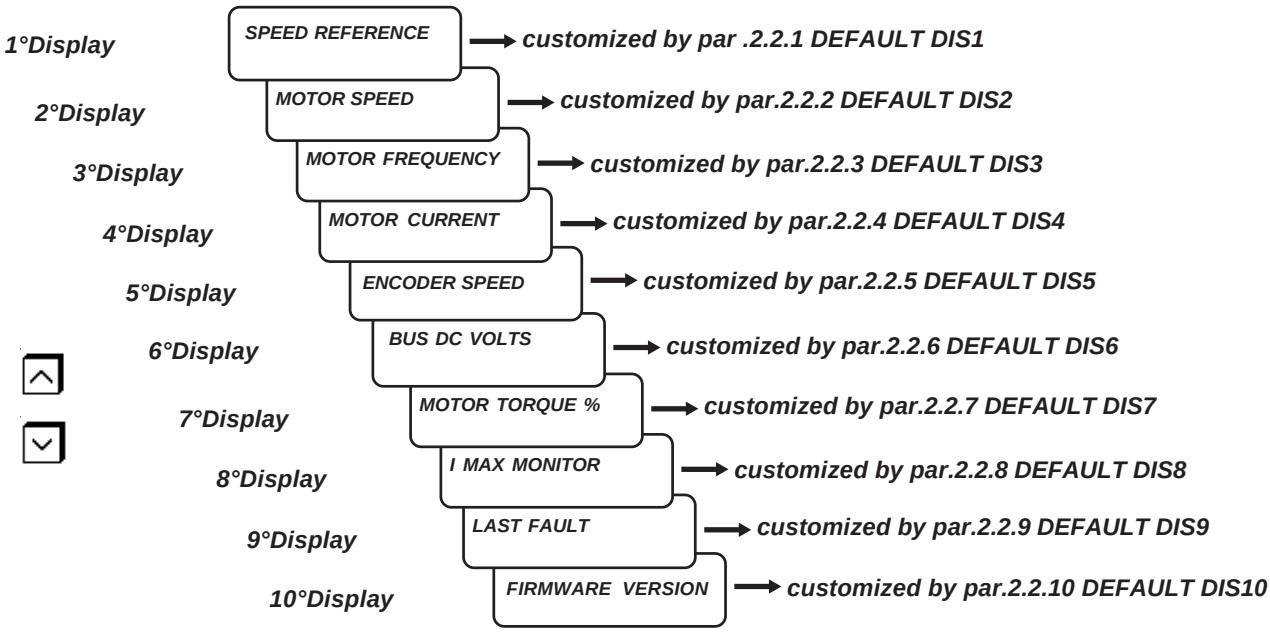


DISPLAY STATUS description

DISPLAY STATUS

It is the first status level the inverter displays when it is powered up and to which it always goes back by repeatedly pressing ESCAPE key during setup operations.

In DISPLAY STATUS, with standard setup, the following 10 variables from 2.1 DISPLAY VARIABLE menu are displayed:



Use UP and DOWN keys to scroll the variables

The last variabe displayed is always the one displayed when the inverter is powered up.

As for DEFAULT choice, the 10 variables can be changed by their related 10 parameters from 2.2 DEFAULT DISPLAY menu, by choosing among the visualisations from the 2.1 DISPLAY VARIABLE menu and those of the application enabled by par.100.5 APPLICATION.

Eg: If you want the third variable displayed in DISPLAY STATUS to be **2.1.16** LAST FAULT:
Set order nr **2.1.16** in par.2.2.3 DEFAULT DIS3.
As for the selection mode, see paragraph **Menu parameters description 2.2 DEFAULT DISPLAY**.

BASIC DATA MENU description

BASIC DATA — ***It includes the first group of parameters to be set after pressing PROGRAM key.***

BASIC DATA menu has 2 important functions:

In **DEFAULT** configuration, it includes the small group of basic parameters that enables the user to install the inverter in the shortest time, without scrolling all menus.

DEFAULT configuration can be activated in 2 ways, by **par. 100.3 MENU OPERATOR:**

- **par.100.3 MENU OPERATOR= DEFAULT**, besides BASIC DATA menu parameters, all parameters are accessible.

- **par.100.3 MENU OPERATOR= BLOCK,** only BASIC DATA menu parameters are accessible, all further parameters are blocked.

In **OPERATOR** configuration, BASIC DATA menu is free for manual parameters **OPERATOR-type** setup, which is useful when the inverter keyboard is used as machine terminal.

OPERATOR configuration can be activated in 2 ways, by **par. 100.3 MENU OPERATOR:**

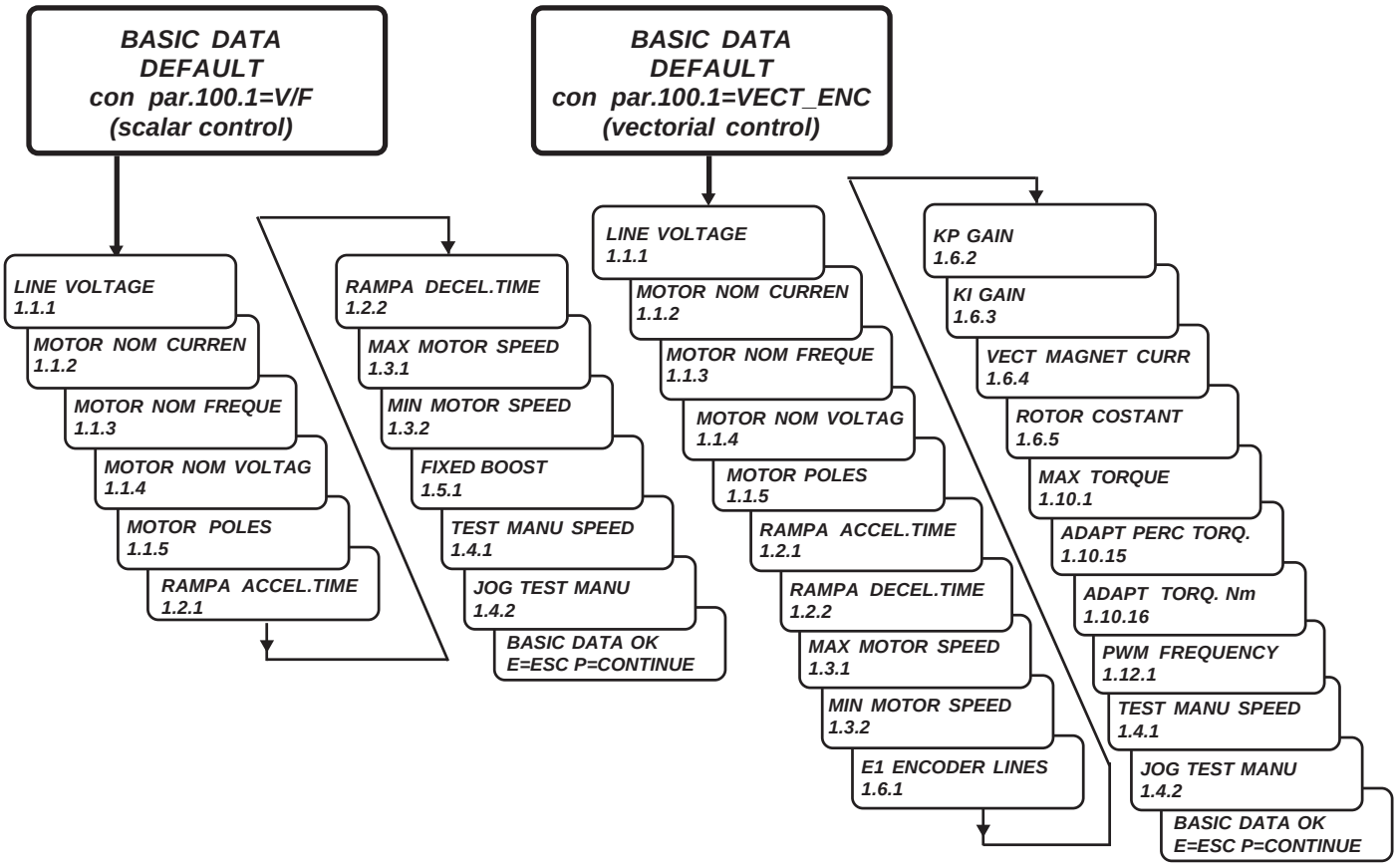
- **par.100.3 MENU OPERATOR=OPERATOR**, besides BASIC DATA menu parameters, all parameters are accessible.

- **par.100.3 MENU OPERATOR= OP_BLOCK,** only BASIC DATA menu parameters are accessible, all further parameters are blocked.

BASIC DATA MENU in DEFAULT mode

In **DEFAULT** configuration, BASIC DATA menu includes a selection of basic parameters that enables the inverter to work, without scrolling all menus; for this reason, they are used for the inverter quick installation, in scalar and vector mode, with the basic function of motor speed control by potentiometer.

The menu content depends on the type of motor control which has previously been set in par. 100.1 MOTOR CONTROL TYPE.



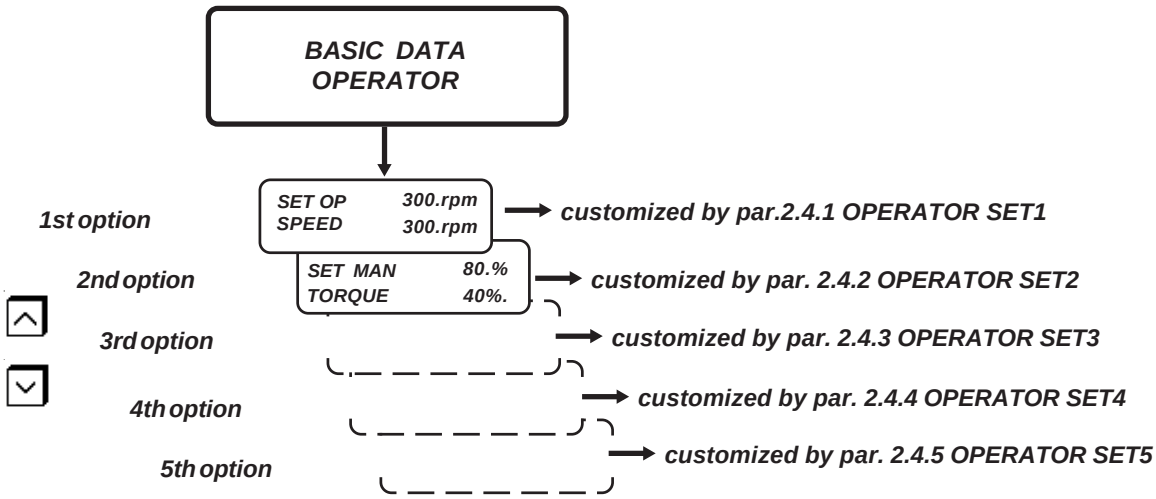
Caution !

BASIC DATA menu parameters are described even in **Chapter 3: QUICK INSTALLATION IN SCALAR MODE** and **Chapter 4: QUICK INSTALLATION IN VECTOR MODE.**

• BASIC DATA menu in OPERATOR configuration

When the keyboard is remoted to be used as manual setup terminal, it is useful to use the OPERATOR function, to customize BASIC DATA menu thanks to a parameter selection performed by the operator. This way, by pressing PROGRAM key, the user can enter the options he is interested in directly, without scrolling the menu.

BASIC DATA menu in OPERATOR function may include up to 5 setup parameters (operator set); in DEFAULT, just 2 parameters are enabled: OPERATOR SET1= par. 3.1.9.2, OPERATOR SET2= par.1.10.14.



These 5 options can be customized freely by **2.4 SETUP OPERATOR** menu parameters.

In parameters OPERATOR SET 1..2..3..4..5, the **order nr** of the chosen OPERATOR parameter must be set. By par. **2.4.6 ACTIVE SET OPER.**, the **max. nr** of parameters to be enabled in BASIC DATA menu must be selected.

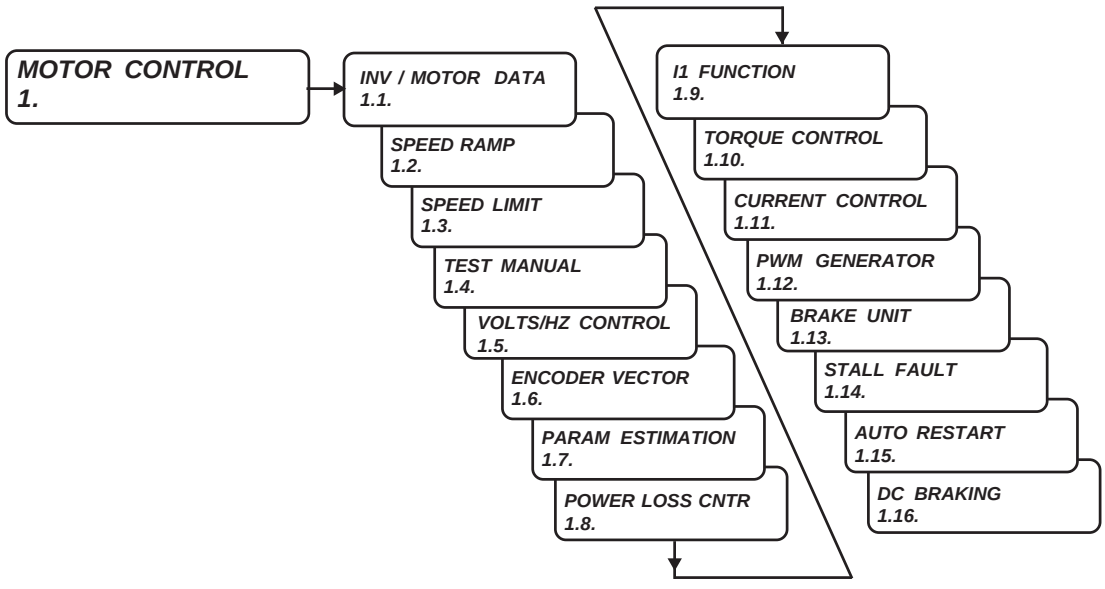
In DEFAULT: **par.2.4.1 OPERATOR SET1= 3.1.9.2**; **par.2.4.2 OPERATOR SET2= 1.10.14**; **par.2.4.6 ACTIVE SET OPER.= 2**.

For the selection mode, see paragraph in this Chapter:

Menu parameters description 2.4 SETUP OPERATOR

Menu structure diagram 1. MOTOR CONTROL

1. MOTOR CONTROL menu includes the menus of the motor plate parameters and of all setup regulating its functioning.



Menu parameters description 1.1. INV. MOTOR DATA

INV / MOTOR DATA
1.1.

Group of parameters including the plate data of the inverter and of the motor connected to U V W outputs.

LINE VOLTAGE
1.1.1 400.V

Supply voltage line connected to L1 L2 L3 terminals

Setup range: from 150V to 600V.

MOTOR NOM CURREN
1.1.2 10.0A

Motor nominal current.

Setup range: from 0.1A to the value set in a standard parameter

MOTOR NOM FREQUE
1.1.3 50.0Hz

Motor nominal frequency.

Setup range: from 0.1 Hz to 800.0 Hz

MOTOR NOM VOLTAG
1.1.4 400.V

Motor nominal voltage.

Setup range: from 1.V to 2000.0V

MOTOR POLES
1.1.5 4 _POLES

Motor poles nr.

Setup range: 2_POLES, 4_POLES, 6_POLES, 8_POLES

NAMEPLATE SLIP
1.1.6 50. rpm

Motor plate power

Setup range from 0.rpm to 1000.rpm

This parameter is useful for the following functions:

- In scalar control, it is used to determine the min. rate slip speed (see **par.1.5.2 MIN SPEED % SLIP**).
- In vectorial control, it is used for slip compensation, if enabled by **par.1.5.17 SLIP COMPENSATION ENABLE= YES** (see Chapter 15, par. SLIP COMPENSATION FUNCTION)
- In scalar control, it is used for current quick limitation by the related parameter **1.5.11.3 PERC SLIP DEC** (see Chapter 15, par. QUICK MOTOR CURRENT LIMITING FUNCTION).

NAMEPLATE KWatt
1.1.7 4.00KW

Motor plate power

Setup range: from 0.00kW to 10000.00kW

NAMEPLATE COS (Ø)
1.1.8 0.730

Motor plate COS Ø.

Setup range: from 0 to 1000

This data is useful for the correct functioning of the slip compensation in scalar control, if enabled by **par.1.5.10 SLIP COMP ENABLE= YES**

MOTOR PTC AI4
1.1.9 10.00V

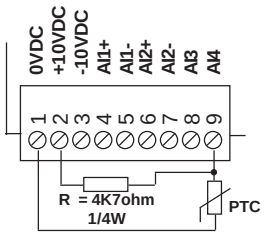
Overheating fault from thermal switch

Setup range: from 0.00V to 10.00V.
This fault is enable if setup value is below 10.00V; In case par.1.1.9 =10.00V the fault is disable, as factory default.
Thermal switch connection is from analogic input AI4 (terminal nr.9) therefore if this control is on **AI4 cannot be used for other functions.**

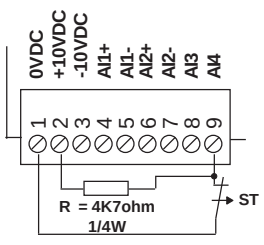
Typical layouts for thermal switch connection:

In both cases set par.1.1.9 = 3.50V.
When analogic input AI4 is over the setup voltage for more than a second, this fault will be on:

33 (MOTOR_PTC_OVER_TEMPERATURE)

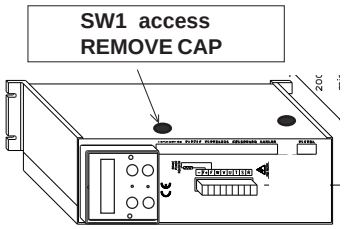


PTC Thermal switch



ON/OFF Contact Thermal switch

As an alternative to external resistor between terminals 2 and 9, we can close the microswitch N. 4 of SW1 on the internal card.
To access SW1, switch off the inverter and wait at least 5 min (for the capacitors to discharge high voltage) and:
- for the inverters from / 3 to / F, open the top cover.
- for the inverters from /P to / L open the cap as shown in the drawing.



MOTOR LOAD FUNC	
1.1.10	NO

Allows higher limit torque in continuous duty if motor/inverter settings has rated frequency arounf 100 Hz (see also Typical Torque Curve table at chap.19)

Setup range: NO, YES

NO: Function disabled, Max Torque is limited to rated value, through the I^2t overload control.

YES: Function enabled, Max Torque limit is increased of 25% of the rated torque, if the frequency is between 0Hz - 55Hz, over this value I^2t overload control intervenes. When frequency has value higher then 55Hz the torque limit is proportionally reduced from 25% to 0 at 100Hz.

Menu parameters description *1.2. SPEED RAMP*

SPEED RAMP	
1.2.	

Group of parameters with acceleration and deceleration ramps setup on the motor speed.

RAMP ACCEL. TIME	
1.2.1	10.00s

Ramp acceleration time of the motor speed from 0 to 1500 rpm

Setup range: from 0.01s to 600.00s
Note: the time of ramp is proportional to the speed; at 3000 rpm the time is doubled.

RAMP DECEL. TIME	
1.2.2	10.00s

Ramp deceleration time of the motor speed from 0 to 1500 rpm

Setup range: from 0.01s to 600.00s
Note: the time of ramp is proportional to the speed; at 3000 rpm the time is doubled.

ENABLE S RAMP	
1.2.3	NO.

Enable S ramps on set speed

Settings: NO, YES
NO = linear ramps; ***YES*** = S ramps
The S ramps are obtained by rounding the linear ramps with a filter, with its filtration time set at **par. 1.2.4 ROUNDING FILTER.**
In practice the S ramps will have a duration equal to the sum of the ramp time set at parameters **par.1.2.1 RAMP ACCEL TIME** or **par.1.2.2 RAMP DECEL TIME**, plus the filtration time set at parameter **par.1.2.4 ROUNDING FILTER**.
To optimise the S ramp it is best to set **par.1.2.4 ROUNDING FILTER** equal to the ramp time to have to round.
The same setting is used both accelration and decelration ramps, so the value set has to be the shortest.

Caution! **X MOTOR SPEED** is greater than 6000rpm the "S" ramps are automatically disabled.
If S ramps are enabled or disabled during a ramp, the ramp continuity is always guaranteed (without transient).
If parameter **par.1.8.1 ENABLE LOSS CNTR = YES** is enabled, when there is a voltage drop that triggers the speed drop control , the ramps are forced into linear even if **par.1.1.3 ENABLE S RAMP = YES**.
Since the S ramps are obtained by rounding the linear ramps with a filter a delay is created, which is dependent on **par.1.2.4 ROUNDING FILTER** so, if a stop is performed by digital input during an S ramp, the ramp speed does not start decelerating immediately as would happen with a linear ramp.
The S ramps can only be enabled with the SPEED application, linear ramps are performed for all other applications, even with **par.1.1.3 ENABLE S RAMP = YES**.

ROUNDING FILTER	
1.2.4	30.00s

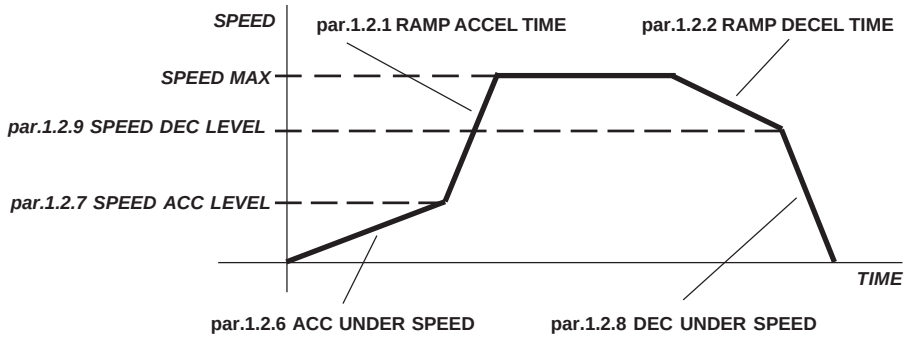
Linear ramp rounding filter time for S ramps

Settings: 0.01s to 300.00s.
The parameter is only enabled with **par.1.1.3 ENABLE S RAMP = YES** and only in the SPEED application.

FUNC. CHANGE RAMP 1.2.5 NO. ***Enable the facility of automatically selecting the ramp change on the set speed according to 2 programmable speed thresholds.***

Settings: NO, YES
NO = the ramps on the set speed are given by **par.1.2.1 RAMP ACCEL TIME** and **par.1.2.2 RAMP DECEL TIME** or the ramps set in menu **3.1.7 FIXED ACC.RAMPS** or **3.1.8 FIXED DEC.RAMPS** if enabled by a digital input.
YES = the ramp change is enable in the following way (see graph):
In ACCELERATION:
- with speeds below the threshold set at **par.1.2.7 SPEED ACC LEVEL**, the enabled acceleration ramp is set at **par.1.2.6 ACC UNDER SPEED,** while with greater speeds, the enabled ramp is set at **par.1.2.1 RAMP ACCEL TIME** (or a ramp of menu **3.1.7 FIXED ACC.RAMPS** if selected).

In DECELERATION:
- with speeds below the threshold set at **par.1.2.9 SPEED DEC LEVEL**, the enabled deceleration ramp is set at **par.1.2.8 DEC UNDER SPEED,** while with greater speeds, the enabled ramp is set at **par.1.2.2 RAMP DECEL TIME** (or a ramp of menu **3.1.8 FIXED DEC.RAMPS** if selected).



Caution !
The rampechange function is only possible with the SPEED application (**par.100.5 APPLICATION=SPEED**), in SCALAR and VECTOR control.

ACC UNDER SPEED 1.2.6 30.00s ***Acceleration ramp time with motor speed under the threshold set at par.1.2.7 SPEED ACC LEVEL.***
Settings: 0.01s to 600.00s
Rampa attiva only with **par.1.2.5 FUN CHANGE RAMP=YES**. (see description of parameter 1.2.5).

SPEED ACC LEVEL 1.2.7 800.rpm ***Set motor speed threshold for acceleration ramp change***
Settings: 0.rpm to setting in ***par.1.3.1 MAX MOTOR SPEED.***
Ramp enabled only with **par.1.2.5 FUN CHANGE RAMP=YES**. (see description of parameter 1.2.5).
If 0 rpm is set the ramp change is disabled and the ramp at ***par.1.2.6 ACC UNDER SPEED*** is never performed.

DEC UNDER SPEED 1.2.8 30.00s ***Deceleration ramp time with motor speed under the threshold in par.1.2.9 SPEED DEC LEVEL.***
Settings: 0.01s to 600.00s
Ramp enabled only with **par.1.2.5 FUN CHANGE RAMP=YES**.

SPEED DEC LEVEL 1.2.9 800.rpm ***Set motor speed threshold for deceleration ramp change***
Settings: 0.rpm to setting in ***par.1.3.1 MAX MOTOR SPEED.***
Ramp enabled only with **par.1.2.5 FUN CHANGE RAMP=YES**. (see description of parameter 1.2.5).
By setting 0 rpm the ramp change is disabled and the ramp at **par.1.2.8 ACC UNDER SPEED** is never performed.

Menu parameters description 1.3. SPEED LIMIT

SPEED LIMIT
1.3.

Group of parameters with setup of the motor speed basic limits.

MAX MOTOR SPEED
1.3.1 1500.rpm

Max. motor speed.

Setup range: from 30.rpm to 24000rpm

MIN MOTOR SPEED
1.3.2 0.rpm

Min. motor speed.

Setup range: from 0.rpm to the value set in **par.1.3.1 MAX MOTOR SPEED.**

Caution!

By par.1.9.1 I1 SPEED STOP = YES, the min. speed setup by par.1.3.2 MIN MOTOR SPEED is no longer active, like it is set equal to 0.

Menu parameters description 1.4. TEST MANUAL

TEST MANUAL
1.4.

Group of parameters enabling the motor rotation test by the keyboard.

TEST MANU SPEED
1.4.1 300.rpm

Reference motor speed during the motor rotation test by the keyboard manual commands.

Setup range: from 0.rpm to the value set in **par.1.3.1 MAX MOTOR SPEED.**

JOG TEST MANU
1.4.2 NO

Enables the rotation test by the keyboard manual commands.

Select YES to enter the test; the following screen will be displayed:

UP=DX DOWN=SX
SPEED 0.rpm

- ***To perform the rotation test by UP and DOWN keys:***
  - Close the RUN contact the RUN light power on
  - Press UP and DOWN keys to rotate the motor in both directions.

  In SPEED, the motor speed will be displayed, which must correspond with the value set in par.1.4.1
- Press ESCAPE to end the rotation test by the keyboard manual commands. The display will return to par.1.4.2

Caution !

In applications different from SPEED, the rotation test is not possible.

Menu parameters description 1.5. VOLTS/Hz CONTROL

VOLTS/Hz CONTROL
1.5

Group of parameters regulating the V/F scalar control functioning

FIXED BOOST
1.5.1 10.0%

Boost power voltage applied to the motor in a permanent way.
In % on the L1 L2 L3 supply voltage line

Setup range: from 0.0% to 25.0%. The boost is active from 0.0Hz to 20.0Hz

To determine the best value to be indicated as boost voltage, in no-load condition adjust the motor speed just over the min. working speed VF MIN SPEED (see par.1.5.2 MIN SPEED % SLIP) and set in this parameter a value bringing the motor absorbed nominal current between ½ and ¾ of the nominal value.

MIN SPEED % SLIP
1.5.2 200.%

Parameter determining the min. working speed in V/F scalar control, below which RUN is disabled.

Setup range: from 0.% to 500.% of the slip speed set in par.1.1.6 NAMEPLATE SLIP.

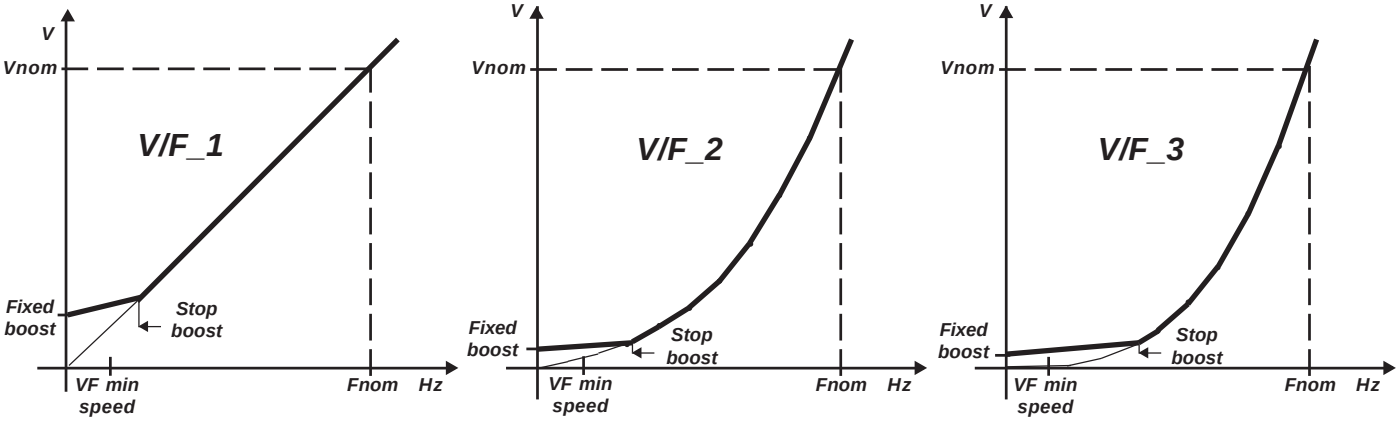
The min. working speed is calculated automatically as follows:

VFmin speed= (par.1.1.6 NAMEPLATE SLIP* par.1.5.2 MIN SPEED % SLIP)/100

V/F TYPE	
1.5.3	V/F_1

Selects 3 Voltage/Frequency features in V/F scalar control.

Setup range V/F_1, V/F_2, V/F_3 according to the features shown in the diagrams below:



Fnom= Motor nominal frequency set in **par.1.1.3 MOTOR NOM FREQUE** (motor plate data).
Vnom= Motor nominal voltage supply set in **par.1.1.4 MOTOR NOM VOLTAG** (motor plate data).
Fixed boost= Power voltage applied to the motor in a permanent way by **par.1.5.1 FIXED BOOST**; this power voltage is active from 0Hz to the frequency set in **par.1.5.4 STOP BOOST FREQ.** and it helps improving low speeds torque performance.
VF min speed= Frequency below which RUN is disabled; it is calculated automatically as follows:
VF min speed= (par.1.1.6 NAMEPLATE SLIP * par.1.5.2 MIN SPEED % SLIP) / 100.

Stop boost= Frequency to be set in **par.1.5.4 STOP BOOST FREQ.**, over which the set boosts in **par.1.5.1 FIXED BOOST** and **par.1.5.5 ACCELER BOOST** are reset.

STOP BOOST FREQ.	
1.5.4	25.0Hz

Motor frequency, above which the boost power voltages set in par.1.5.1 FIXED BOOST and par.1.5.4 ACCELER BOOST are cleared.

Setup range: from 10.0Hz to the value set in par.1.1.3 MOTOR NOM FREQUE.

Boost power voltages set in par. 1.5.1 FIXED BOOST and par.1.5.4 ACCELER BOOST are summed to the V/F curve up to the frequency set in this parameter; this way, V/F curve boost can be fit more easily, not only in amplitude, but its frequency range as well

ACCELER BOOST	
1.5.5	0.0%

Boost power voltage applied to the motor only in acceleration phase.
In % on the L1 L2 L3 supply voltage line

Setup range: from 0.0% to 25.0%.

It is automatically enabled during an acceleration ramp from 0Hz to frequency value set in par. 1.5.4 STOP BOOST FREQ.

ENABLE FLYING VF	
1.5.6	NO.

Enables the motor pick-up when the RUN command is activated.

Setup range: NO, YES.

NO= Motor pick-up disabled; **YES**= Motor pick-up enabled

If the motor pick-up is enabled, the activation of the RUN command is postponed by 5sec.

SLIP COMP ENABLE	
1.5.7	NO.

Enables the motor slip compensation

Setup range: NO, YES.
NO= compensation disabled; **YES**= compensation enabled

NO LOAD I COS (Ø)	
1.5.8	3.0A

Current absorbed in no-load motor multiplied for phase angle cosine function.

Setup range: from 0.1A to 3000.0A.
This parameter is useful for the correct functioning of the motor slip compensation.
The value to be set is calculated as follows:
Bring the motor in no-load condition reach its rated speed (e.g. 1500rpm) and read the the value displayed in var.2.1.11 I x COS(Ø); insert the displayed value in par.1.5.8.

OVERLOAD FUNC
1.5.9

Group of parameters which regulate the motor current SLOW limitation function in scalar V/F, (overload control). For details see also cap.15 "SLOW MOTOR CURRENT LIMITATION")

ENABLE OVERLOAD
.1 DISABLE.

Par. 1.5.9.1 Select overload control modality

Setup range:

DISABLE = Overload control disabled

ON/OFF = Overload control enabled with on/off modality on ramp, like C330 serie works.

REG_PI = Overload control by PI regulator enabled

MAX OVERLOAD CUR
1.5.5 300.0%

Max. overload current in % on the motor nominal current set in par.1.1.2 MOTOR NOM CUR.

Setup range: from 100.0% to 300.0%.
When the motor current get over the value set in this parameter, the overload managing starts.
If you set the parameter at 300.0%, the overload control is disabled, as well as parameter 1.5.9.1 ENABLE OVERLOAD=DISABLE.

MIN OVERLOAD SPE
.3 300.rpm

Par. 1.5.9.3. Min. speed in overload control

Setup range: from 0.rpm to the value set in par.1.3.1 MAX MOTOR SPEED.

DEC.RAMP.OVERLO.
.4 10.00s

Par.1.5.9.4. Deceleration ramp in overload control

Setup range: from 0.1s to 300.00s.

This parameter is always on even if par.1.5.9.1 ENABLE OVERLOAD = REG_PI.

KP REG OVERLOAD
.5 20.

Par.1.5.9.5 PI regulator proportional gain in overload control

Setup range: from 0. to 250. (advised value= 1000.)

This parameter is on only if par.1.5.9.1 ENABLE OVERLOAD = REG_PI.

KI REG OVERLOAD
.6 10.

Par.1.5.12.7 PI regulator integral gain in overload control

Setup range: from 0. to 250.

This parameter is on only if par.1.5.9.1 ENABLE OVERLOAD = REG_PI.

MIN SPEED TIME
.7 0.0s

Par.1.5.9.7 Max time at minimum speed in overload control

Setup range: from 0.0s to 1800.0s.

MIN SPEED UNLOCK
.8 REMOTE.

Par.1.5.9.8 Unlock the minimum speed limit during the overload control.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE = Command is OFF and there's no assigned digital input. Command is ON only with apposite serial flag.

I2 ... I14 = Command is assigned to the selected digital input (in OR with apposite serial flag).

ENABLE = Command is ALWAYS ON.

Command ON unlocks minimum speed status.
Note: On vector control (par.100.1= VECT_ENC) this command has a different function:
- when the command is ON, the KI gain set in par.1.6.3 KI GAIN is forced to 0;
- when the command is OFF the KI gain is get back to the original value set in par.1.6.3 KI GAIN.

Caution !

OVERLOAD CONTROL WARMINGS

Overload control works together with HIGH TORQUE function (1.5.10 Menu: HIGH TORQUE FUNC):

- If Par 1.5.10.4 HT OVERL. SPEED = 0 or is equal / lower than **VF min speed**, overload control is always on.

- If Par 1.5.10.4 HT OVERL. SPEED is greater than **VF min speed**, overload control is on when ramp speed set is greater than par.1.5.10.4 HT OVERL. SPEED value.

Overload control works distincly from current quick limiting (1.5.11 menu CURRENT LIMIT); so these controls can work at the same time.

HIGH TORQUE FUNC
1.5.10

Group of parameters which regulate HIGH TORQUE function (AUTOMATIC BOOST) that increases starting torque in V/F SCALAR control.

PERC UP V/F
.1 6.0%

Par.1.5.10.1. Maximum BOOST voltage supplied to the motor by HIGH TORQUE control regulator This value is addeed to the V/F curve) and it is expressed as percent of L1 - L2 - L3 values.

Setup range: from 0.0% to 25.0%

AUTOMATIC BOOST function is on for whole speed set range.

KP UP V/F
.2 10.

Par.1.5.10.2. HIGH TORQUE control regulator proportional gain.

Setup range: from 0. to 100.

If motor current is greater than nominal motor current, current error is amplified with this parameter value in proportion, regulator output is saturated (Volts) by par. 1.5.10.1 PERC UP V/F; this amount is added to V/F curve.

Examples of possible gains are the following:

KP = 1	200% of Nominal Current increases motor voltage of +1.0%
KP = 1	110% of Nominal Current increases motor voltage of +0.1%
KP = 1	100% of Nominal Current increases motor voltage of +0.0%
KP = 10	200% of Nominal Current increases motor voltage of +10.0%
KP = 10	110% of Nominal Current increases motor voltage of +1.0%
KP = 10	100% of Nominal Current increases motor voltage of +0.0%
KP = 100	200% of Nominal Current increases motor voltage of +100.0%
KP = 100	110% of Nominal Current increases motor voltage of +10.0%
KP = 100	100% of Nominal Current increases motor voltage of +0.0%

HT MAX TIME MSEC
.3 10.000s

Par.1.5.10.3. Automatic BOOST maximum duration by HIGH TORQUE control regulator.

Setup range: from 0.000s to 30.000s.

If V/F SCALAR control with HT function is on, this parameter limits the maximum BOOST duration on V/F voltage, once this limit has expired, voltage returns on the V/F curve even if the absorbed motor current isn't lower than nominal current. Furthermore, before HT function will be newly available, the corresponding Par. 1.5.10.3 HT MAX TIME MSEC time has to run on.

HT OVERL. SPEED
.4 1300rpm

Par.1.5.10.4. Speed reference for HIGH TORQUE and OVERLOAD controls.

Setup range: from 0rpm to 30000rpm.

Using this setting and par. 1.5.10.5 SPEED DISABLE HT, you can determine these HIGH TORQUE FUNC in SCALAR V/F Control functions:

-If HT OVERL. SPEED = 0 or <= **VF min speed** (see also par.1.5.3 V/F TYPE), HIGH TORQUE FUNC and OVERLOAD FUNC are always ON (see also par.1.5.9 OVERLOAD FUNC).

-If HT OVERL. SPEED > **VF min speed** and par.1.5.10.5 SPEED DISABLE HT = YES, at start OVERLOAD FUNC is off but HIGH TORQUE FUNC is on. Once the speed ramp is greater than HT OVERL. SPEED, OVERLOAD FUNC will be on, instead HIGH TORQUE FUNC will be off.

-If HT OVERL. SPEED > **VF min speed** and par.1.5.10.5 SPEED DISABLE HT = NO, at start OVERLOAD FUNC is off but HIGH TORQUE FUNC is on. Once the speed ramp is greater than HT OVERL. SPEED, OVERLOAD func DECREASE will be on and, at the same time, HIGH TORQUE FUNC will be on too.

SPEED DISABLE HT
.5 YES

Par.1.5.10.5. See also par 1.5.10.4 HT OVERL. SPEED

Setup range: YES - NO.

Caution !

- An important parameter for the full efficiency of HT function is par.1.5.1 FIXED BOOST, which is the permanent voltage on motor. We suggest to put the motor on slightly over th minimum speed without load and set this value to keep the absorbed current between 1/2 and 3/4 of nominal current.

- For HT - HIGH TORQUE function details see also **Chap.15 par. "TORQUE AUGMENTATION (HIGH TORQUE)"**

CURRENT LIMIT
1.5.11

Group of parameters which regulate the quick current limitation function in SCALAR control, both in Acceleration Ramp and in steady state.

MOD I LIM RAMP
.1 StopRAMP.

Par.1.5.11.1 selects the current limitation function mode during the acceleration ramp.

Setup range: DISABLE, STOP_RAMP, PI_RAMP

DISABLE= current limitation function in acceleration ramp, disabled.

STOP_RAMP= when the current value is higher than the value set in par.1.5.11.2 Imax ACC RAMP, the speed ramp is slowed 10 times down and, if par.1.5.11.3 PERC SLIP DEC is different from 0, the frequency set (speed reference) is derated for one speed defined through: (1.1.6 NAMEPLATE SLIP* 1.5.11.3 PERC SLIP DEC)/ 100.
PI_RAMP= when the current is higher than the value set in par.1.5.11.2 Imax ACC RAMP, the PI regulator is enabled; the regulator output is taken off from the speed set when the acceleration ramp is ended.

Caution !

In any case, with the current limitation function enabled, the speed set can decrease to max. **VF min speed**, so the motor goes on working at the lowest speed (below **VF min speed**, RUN command is disabled).

Imax ACC RAMP
.2 10.0A

Par. 1.5.11.2 Max limits of the motor current in Acceleration ramp.

Setup range: from 0.1A to the value set in a default parameter.

The limitation is enabled only by par.1.5.11.1 MOD I LIM RAMP= STOP_RAMP or PI_RAMP.

Par. 1.5.11.1 MOD I LIM RAMP has NO effect on BOOST limiter control set by par. 1.5.11.8 KP Imax BOOST and par.1.5.11.9 KI Imax BOOST).

PERC SLIP DEC
.3 50.%

Par.1.5.11.3 determines the speed reduction in current limitation mode set by par.1.5.11.1 MOD I LIM RAMP= STOP_RAMP.

Setup range: from 0.% to 300% of the value set in par.1.1.6 NAMEPLATE SLIP.
The speed reduction takes place when the current value is higher than the value set in par.1.5.11.2 Imax ACC RAMP; at the same time the speed ramp growth is stopped. The speed reduction is defined:
(1.1.6 NAMEPLATE SLIP * 1.5.11.3 PERC SLIP DEC)/ 100

MOD I LIM STEADY
.4 PI_REG

Par.1.5.11.4 selects the current limitation function mode in steady state.

Setup range: DISABLE, PI_REG
DISABLE= current limitation function, while motor is running in steady state condition in scalar mode, disabled.
PI_REG= when the speed set acceleration ramp is over and the current value is higher than the value set in par.1.5.11.5 Imax STEADY, PI regulator is enabled.

Imax STEADY
.5 15.0A

Par.1.5.11.5 limits the max. current of the motor running in steady state.

Setup range: from 0.1A to the value set in a default parameter.

The limitation is enabled only by par.1.5.12.4 MOD I LIM STEADY= PI_REG.

Par. 1.5.11.4 MOD I LIM STEADY has NO effect on BOOST limiter control set by par. 1.5.11.8 KP Imax BOOST and par.1.5.11.9 KI Imax BOOST).

KP REG PI
.6 1000.

Par.1.5.11.6 PI regulator proportional gain for the limitation of the current in acceleration ramp and in steady state functioning.

Setup range: from 0. to 1000. (suggested value= 1000.)
In case of too high KP values, when the current value is exceeding, the speed decreases too much and the control may start oscillating; In case of too low KP values, when the current value is exceeding, the speed decreases too little and the current may cause the inverter stop for FAULT1 (MAX PEAK CURRENT).

KI REG PI
.7 1.

Par.1.5.11.7 PI regulator integral gain for the limitation of the current in acceleration ramp and in steady state functioning.

Setup range: from 0. to 1000. (advised value= 1.)
In case of too high KI values, when the current value is exceeding, the speed decreases too much and the control may start oscillating; In case of too low KI values, when the current value is exceeding, the speeed decreases too slowly and the current may cause the inverter stop for FAULT1 (MAX PEAK CURRENT).

Caution !

CURRENT QUICK LIMITING WARNINGS

Current quick limiting works distincly from Overload control (1.5.9 OVERLOAD FUNCT); so these controls can work at the same time.

KP Imax BOOST	
.9	300

Par.1.5.11.8 PI regulator proportional gain for BOOST voltage limitation function, in ACCELERATION and in steady state functioning, when Imax is passed.

Setup range: from 0. to 1000.

KI Imax BOOST	
.9	50

Par.1.5.11.9 PI regulator integral gain for BOOST voltage limitation function, in ACCELERATION and in steady state functioning, when Imax is passed.

Setup range: from 0. to 1000.

NOTES ON THE BOOST VOLTAGE LIMITATION

It is realized with a regulator lowing the boost voltage (sum of all possible voltage boosts) in order to avoid getting over the maximum set current. The limitation is done by par. 1.5.11.2 Imax ACC RAMP during the acceleration and by par. 1.5.11.5 Imax STEADY in steady-state conditions.
You can disable the function by setting par.1.5.11.9 KI Imax BOOST = 0.

SPEED JUMP
1.5.12

Group of parameters which determines two speed sets into which motor stop is forbidden both in SCALAR V/F and VECTOR (Encoder) mode

JUMP SET1	
..12.1	0.rpm

Par.1.5.12.1 First speed set to be skipped

Setup range: 0.rpm to 24000.rpm
speed value is absolute, its direction is not relevant.

JUMP SET2	
..12.2	0.rpm

Par.1.5.12.2 Second speed set to be skipped

Setup range: 0.rpm to 24000.rpm
speed value is absolute, its direction is not relevant.

JUMP BAND	
..12.3	0.rpm

Par.1.5.12.3 Hysteresis range around the frequency to be skipped

Setup range: 0.rpm to 600.rpm
speed value is absolute, its direction is not relevant.
if it is set = 0, speed jump functions is disabled.

SPEED JUMP NOTE:

These functions are really useful to skip certain speed ranges which may cause resonance disturbs to the mechanical transmission. These specific ranges can be performed during a ramp anyway.
To avoid oscillations around the speed to be jumped, set par.1.5.12.1 JUMP SET1 and par.1.5.12.2 JUMP SET2 and raise the hysteresis by par.1.5.12.3 JUMP BAND. To disable the jumps, set par.1.5.12.3 JUMP BAND=0.

Menu parameters description 1.6. VECTOR ENCODER

ENCODER VECTOR
1.6

Group of parameters regulating the vector control functioning.

E1 ENCODER LINES
1.6.1 2000.

ENCODER 1 pulse per revolution number.

Setup range: from 1. to 5000. pulses/r

Caution ! → At the motor fastest rate, the encoder pulse frequency can't exceed 125KHz.

KP GAIN
1.6.2 25.

KP proportional gain of the motor speed regulator.

Setup range: from 0. to 100
-KP GAIN = 0 proporzional gain excluded
-KP GAIN = 100 proportional gain with the maximum precision of the speed control.

KI GAIN
1.6.3 25.

KI integral gain of the motor speed regulator.

Setup range: from 0. to 100
-KI GAIN = 0 integral gain excluded
-KI GAIN = 1 integral gain with slow response time
-KI GAIN = 100 integral gain with fast response time
Note: You can reset the integral gain by the programmable command in par.1.5.9.8 MIN SPEED UNLOCK:
- when the command is ON the gain is forced to 0 (and the visualization in this parameter too).
- when the command is OFF the gain is get back to the original value set in this parameter.

VECT MAGNET CUR
1.6.4 50.0%

Magnetization current of the motor in no-load conditions.
In % to the motor nominal current set in par.1.1.2 MOTOR NOM CURREN.

Setup range: from 0.0% to 100.0%.

ROTOR CONSTANT
1.6.5 6.8Hz.

Represents the max. slip, at the max. current, of the vector control without any torque limitations enabled.

Setup range: from 0.0Hz to 150Hz

Caution ! → Regarding Inverter sizes to /D to /F, you must set the actual value multiplied 16 time.

E2 ENCODER LINES
1.6.6 1000.

ENCODER 2 pulses per revolution number.

Setup range: from 1. to 5000. pulses/r

Caution ! → At the encoder fastest rate, the pulse frequency can't exceed 125KHz.

IN ENABLE ENC 2
1.6.7 REMOTE

Assigns the encoder selection between ENCODER 1 and ENCODER 2, for vector control

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, II0, I11, I12, I13, I14, ENABLE
REMOTE= Set ENCODER 1 in a fixed way; ENCODER 2 activation is possible only by the serial driven flag (see Instruction Manual INVERTER 400 SERIAL TRANSMISSION).
I2..I14= Command assignation to the selected digital input (in OR with its related serial flag).
ENABLE= ENCODER 2 fixed activation.
Selection mode: By input or flag OFF, ENCODER 1 is used. By input or flag ON, ENCODER 2 is used

ADAPT Id TABLE
1.6.8 100.0%

It fits the curve of the magnetization current in constant power zone, field weakening control.
Used setting par. 1.6.15 FIELD WEAK TYPE = TABLE.

Setup range: from 10.0% to 200.0%.

By setting 100.0%, the curve of the Id current in constant power zone remains that for default. For different values, the curve is modified as follows:

The magnetization current is redeced from the value set in par. 1.6.4 VECT MAGNET CURR using the value set in this parameter: e.g. if par.1.6.8 = 100%, at 3000rpm (twice the nominal speed) the field weakening curve imposes a 0.500 magnetization current, if you want it to impose 0.333, you must adapt the value as follows:

ADAPT Id TABLE = (1 - 0.333) / (1 - 0.5) *100.0 = 133%

Therefore, if ADAPT Id TABLE= 133.0%, the magnetization current at 3000rpm is 0.333 times the value set in par. 1.6.4 VECT MAGNET CURR.

BRUSHLESS 1.6.9	→	***Not enabled group of parameters***

FT DERIVATIVE 1.6.10 150.Hz	***Cut frequency for Derivative Action (KD) in speed control.***

Setup range: from 1.Hz to 1000.Hz

KD GAIN 1.6.11 0.	***Motor speed regulator KD Derivative Gain in speed control.***

Setup range: from 0. to 100.

DERIVATIVE MODE 1.6.12 FEEDBACK	***Derivative Action Mode***

Setup range: FEEDBACK, ERROR, BOTH

FEEDBACK = Derivative Action is taken from speed feedback (encoder), this is the best choice for speed overshoot limiting in step response.

ERROR = Derivative Action is taken from chasing error, which is the difference between set and feedback; this modality increases the additional torque at start of sudden transient.

BOTH = FEEDBACK and ERROR modes are enabled together.

Caution ! → If speed set is noisy, the derivative action may increase noise.

KP KI REGULATOR 1.6.13	***Group of parameters that control the gain of the current loop of the vector control. Should be set according to the combination with the Rowan vectorial motor (see cap.20).***

KP ID REGULATOR 1.6.13.1 0.9500	***Proportional gain of the Id current***

Setup range: from 0.0000 to 3.0000

KI ID REGULATOR 1.6.13.2 0.1000	***Integral gain of the Id current***

Setup range: from 0.0000 to 3.0000

KP IQ REGULATOR 1.6.13.3 0.9500	***Proportional gain of the Iq current***

Setup range: from 0.0000 to 3.0000

KI IQ REGULATOR 1.6.13.4 0.1000	***Integral gain of the Iq current***

Setup range: from 0.0000 to 3.0000

KI UP NOM SPEED 1.6.14 5	***Integral gain setup of speed regulator, for speed over at nominal speed value***

Setup range: from 0 to 100.

For the speed lower than nominal speed the integral gain value of the speed regulator is equal to the par.1.6.3 KI GAIN.

If the set value on the par.1.6.14 KI UP NOM SPEED is bigger than 0 for speed values are bigger than nominal speed, the integral gain takes the new setting value.

Settings the par. equal to 0 the integral gain value don't have any variation, remain equal to the par.1.6.3 KI GAIN value for entire speed variation range.

FIELD WEAK TYPE 1.6.15 TABLE	***Selection of asynchronous motor control algorithm in costant power zone***

Setup range: TABLE, FEEDBACK

Settings 1.6.15 FIELD WEAK TYPE = TABLE for speed bigger than nominal value, the motor magnetizazion reduce, decreasing the magnetizing current settle through a predefine table. This table is adaptable through the par.1.6.8 ADAPT Id TABLE.

Settings 1.6.15 FIELD WEAK TYPE = FEEDBACK the motor magnetizazion in costant power function zone, reduce through a voltage control loop. The magnetizing current it is automatically reduce directly to the speed increase to mantain the voltage value supply to the motor, lower than nominal value set to the par.1.1.4 MOTOR NOM VOLTAGE. The voltage is limited to the maximum value available of the inverter, in case it is lower than nominal motor value.

Menu parameters description 1.7. PARAM ESTIMATION

PARAM ESTIMATION
1.7.

Group of parameters that govern the operation of the estimator of the rotor constant in relation to the heating of the motor and motor auto-tuning procedure.

ENABLE EST TAUR
1.7.1 NO.

Enable or not the estimator of the rotor constant (par.1.6.5 ROTOR COSTANT)

Setup range: NO, YES
The rotor constant, initially set in par.1.6.5 ROTOR COSTANT, is adjusted following the work condition (for example the temperature change) to achieve a costant current demand.
If YES is selected the correction algorithm is enabled, instead with setting NO the algorithm is disabled.
The function could require an adjust of the par. 1.6.4 VEC MAGNET CURR to get the maximum torque per amperes ratio in the operation point.

STATOR L
1.7.2 0.0mH

Stator Inductance, in reference to the asynchronous motor equivalent circuit reported in "CATALOGUE ROWAN G SERIES MOTORS"

Setup range: from 0.0mH to 3000.0mH

ROTOR L
1.7.3 0.0mH

Rotor inductance, in reference to the asynchronous motor equivalent circuit reported in "CATALOGUE ROWAN G SERIES MOTORS"

Setup range: from 0.0mH to 3000.0mH

MUTUAL INDUC
1.7.4 0.0mH

Mutual inductance between the stator and rotor, in reference to the asynchronous motor equivalent circuit reported in "CATALOGUE ROWAN G SERIES MOTORS"

Setup range: from 0.0mH to 3000.0mH

ENABLE AUTO TUN
1.7.5 NO

Parameter of procedure autotuning start

Setup range: NO, STATIC, DYNAMIC
Selecting STATIC will be executed the autotuning procedure "standing still", the motor shaft stay still during the test.
Selecting DYNAMIC will be executed the autotuning procedure “in movement”, the motor shaft rotate during the test.
Refer to chapter 22 "VECTOR CONTROL OF OTHER BRANDS ASYNCRONOUS MOTOR".

Menu parameters description 1.8. POWER LOSS CNTR

POWER LOSS CNTR
1.8.

Group of parameters regulating the inverter functioning in case of main line voltage dips.

ENABLE LOSS CNTR
1.8.1 **NO.**

Enables or not the motor speed control in case of main line voltage dips.

Setup range: NO, YES

Functioning description in case of voltage dips:

par.1.8.1= NO, in case of voltage dip causing a BUSDC fall under the set value in a standard parameter, the RUN is off; it is automatically restored when the BUSDC is over the value set in another standard parameter.

par.1.8.1= YES, in case of voltage dip, the following operation will be performed in order to avoid a machine block: when the voltage dip causes the BUSDC level decreasing under the threshold set in **par.1.8.2 START THRESHOLD**, the motor decelerates until it reaches the speed set in **par.1.8.6 START SPEED** with deceleration ramp set in **par.1.8.5 DECEL TIME**. If the voltage dip lasts longer than the time period set in par.1.8.7 TIME LIMIT, the speed set is decreased to 0rpm up to inverter powering off.

If during the voltage dip the line voltage is restored normally, when the BUSDC exceeds the value set in **par.1.8.3 +STOP THRESHOLD**, the speed deceleration ramp set stops and the initial speed value is restored after 500ms, with acceleration ramp set in **par.1.8.4 ACCEL TIME**.

In both cases, voltage dips are counted in **variable 2.1.42 POWER LOSS COUNT**.

START THRESHOLD
1.8.2 **150.V**

BUSDC voltage below which, in case of voltage dips, the motor decelerates until it reaches the speed set in par.1.8.6 START SPEED.

Setup range: from 0.V to 2000.V

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

+STOP THRESHOLD
1.8.3 **50.V**

Voltage that, if added to the value in par.1.8.2, determinates the BUSDC limit exceeding which the speed set is restored after a voltage dip.

Setup range: from 0.V to 2000.V

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

ACCEL TIME
1.8.4 **15.00s**

Acceleration ramp in speed set restoring after a voltage dip.

Setup range: from 0.01s to 600.00s

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

DECEL TIME
1.8.5 **15.00s**

Deceleration ramp in case of voltage dip.

Setup range: from 0.01s to 600.00s

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

START SPEED
1.8.6 **500.rpm**

Speed set in case of voltage dip for a max. period set in par.1.8.7 TIME LIMIT

Setup range: from 0rpm to the value set in par.1.3.1 MAX ROTOR SPEED

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

TIME LIMIT
1.8.7 **10.000s**

Max. voltage dip time exceeding which the speed set is kept to 0 until the inverter powers off.

Setup range: from 0.001s to 30.000s

Parameter enabled only if par.1.8.1 ENABLE LOSS CNTR= YES

Menu parameters description 1.9. I1 FUNCTION

I1 FUNCTION
1.9.

Group of parameters regulating the RUN control by I1 digital input or by its related flag command in serial mode. The RUN control activates 0.5sec after powering up, which increases up to 5sec, in case of pick-up in scalar function.

I1 SPEED STOP
1.9.1 NO.

It selects the motor stop type at RUN disabling.

Setup range: NO, YES

NO= At RUN command disabling, the voltage is powered off immediately.

YES= At RUN command disabling, the motor runs to 0rpm with deceleration ramp set and the voltage is powered off.

Caution !

- It is not possible to set par.1.9.1, if par.1.9.3 I1 DC BRAKE= YES.

By par.1.9.1= YES, the min. speed set by par.1.3.2 MIN MOTOR SPEED is no longer active and it is as if it was set to 0.

I1 RESET FAULT
1.9.2 NO.

It enables the possibility to clear FAULT status (FAULT light on), by activating the RUN command.

Setup range: NO, YES

NO= The fault block can be reset only by powering off and then on the inverter again.

YES= The fault block can be reset by powering the interter off and then on disabling the rate control and serial (if it is on).

Caution !

It is not possible to reset the block by rate command, if this is caused by short circuit on voltage components (see FAULT 4.SHORT IGBT MODUL or SHORT IGBT BRAKE in Chapter DRIVE BLOCK).

I1 DC BRAKE
1.9.3 NO.

It enables the direct current brake at RUN command disabling.

Setup range: NO, YES

NO= Brake disabled

YES= At rate disabling, the CD brake starts according to the parameters set in 1.16 CD BRAKING menu.

Caution !

It is not possible to to set par.1.9.3 if par.1.9.1 I1 SPEED STOP= YES

OUT RUN
1.9.4 O3

It assignes a digital output the RUN activation state.

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Drive running= ON output. Drive stopped= OFF output.
The function can be inverted in each parameter output in 4.2 DIGITAL OUTPUT menu.

OUT FAULT
1.9.5 O2

It assignes a digital output the drive fault block state.

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Drive blocked in fault condition= OFF output. Drive not blocked= ON output.

The function can be inverted in each parameter output in 4.2 DIGITAL OUTPUT menu.

At inverter power supplying, the digital output is OFF for about 5sec, then, if no FAULTS occurr, it changes into ON.

MECHANICAL BRAKE
1.9.6.

Group of parameters regulating the mechanical brake (in both scalar and vector mode) and the encoder out of order alarm (only in vector mode). The description of start and stop cycles by mechanical brake is in paragraph "MECHANICAL BRAKE IN LIFTING SYSTEMS" (LIFT function), Chapter 14.

ENABLE MEC. BRAKE
.1 NO

Par.1.9.6. Enables the mechanical brake.

Setup range: NO, YES

NO= Brake function disabled.

YES= Brake function enabled

IN RUN - SPEED	
.2	REMOTE

Par. 1.9.6.2 Assign the RUN control command as by I1 but with the reference speed set sign inverted.

Setup range: REMOTE, I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command OFF and no digital input assigned. Command ON is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always ON.

Select mode:

By input or flag OFF, the RUN is disabled.

By input or flag ON, the rate is active, but with the reference speed set sign inverted (the sign remains inverted if I1 input – or serial rate flag- is enabled at the same time).

The command is enabled only by the mechanical brake function enabled by par.1.9.6.1 ENABLE MEC. BRAKE= yes.

OUT MEC. BRAKE	
.3	REMOTE

Par. 1.9.6.3 Assignes a digital output the brake command.

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Brake blocked= OFF output. Brake free= ON output.

The function can be inverted in each parameter output in 4.2 DIGITAL OUTPUT menu.

DELAY STOP	
.4	0.250s

Par.1.9.6.4 STOP CYCLE delay on brake control.

Setup range: from 0.000s to 30.000s.

It delays the RUN command disabling after the brake block

PERC In START	
.5	30.%

Par.1.9.6.5. Threshold on the motor real current used in START CYCLE..

Setup range: from 0.% to 1000.% of the motor nominal current.

At start, when the motor current exceed this threshold, the brake is unblocked automatically.

If 1000.% is set, the function of this parameter is disabled

DELAY START	
.6	30.000s

Par.1.9.6.6 START CYCLE delay on brake control.

Setup range: from 0.000s to 30.000s.

After this delay, at start, brake is loose in any case.

If 30.000s is set, the function of this parameter is disabled.

Disable this function in case of vector control.

DELAY RAMP START	
.7	0.200s

Par.1.9.6.7 START CYCLE delay in vector control.

Setup range: from 0.000s to 30.000s.

After this delay, at start, the speed set starts its acceleration ramp.

% In LIMIT SPEED	
.8	110.%

Par.1.9.6.8. Setting of speed and current limits in START CYCLE.

Setup range: from 0.% to 1000.% of the motor nominal current.

At start, if the motor current exceed this threshold for the time period set in par.1.9.6.9 DELAY% In LIMIT, the max. motor speed cannot exceed the limit set in par.1.9.6.10 LIMIT SPEED; the limitation is disabled only after a stop and a later start cycles.

If 1000.% is set, the function of this parameter is disabled

DELAY % In LIMIT	
.9	1.000s

Par.1.9.6.9 Current and speed limit delay on START CYCLE.

Setup range: from 0.000s to 30.000s.

Speed limitation activation delay, if the current threshold set in par.1.9.6.8 % In LIMIT SPEED has been surpassed.

LIMIT SPEED	
.10	1500.rpm

Par. 1.9.6.10. Speed limit enabled by the START CYCLE.

Setup range: from 30.rpm to 30000rpm.

Speed limit enabled if the current threshold set in par.1.9.6.8 % In LIMIT SPEED is surpassed for the time period set in par.1.9.6.9 DELAY% In LIMIT

SPEED FAULT ENC.	
.11	20.rpm

Par.1.9.6.11 parameter to setup fault 10 in case of anomalies on the reading of the encoder used for speed feedback (enabled only in vector control).

Setup range: from 0.rpm to 30000rpm. The default setup is 0.rpm. **Set 0rpm to disable fault 10.**

- If the par.1.9.6.11 is different to zero, the encoder control is always active and based to pulse count - indipendent if the mechanical brake is active (par.1.9.6.1); if the inverter doens't detect any pulse from ENCODER 1 for a time period longer than par.1.9.6.12 DELAY FAULT ENC., fault 10 is activated.

- If the mechanical brake is active (par.1.9.6.1 = YES) and the par.1.9.6.11 is different from zero, the both encoder controls pulse count and the setup speed threshold are enabled. With rate on and brake open, if the real speed remains < than the value set in this parameter for a time period longer than par.1.9.6.12 DELAY FAULT ENC., fault 10 is activated.

DELAY FAULT ENC.	
.12	0.200s

Par.1.9.6.12 parameter to setup fault 10 in case of anomalies on the reading of the encoder used for speed feedback (enabled only in vector control).

Setup range: from 0.s to 30000s

In this parameter fault 10 activation delay is set.

INRESET FAULT	
1.9.7	REMOTE

Assigns an input to reset the active faults

Setup Range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE

REMOTE = OFF with no assigned digital input, ON is possible only with corresponding serial flag.

I2 ... I14 = Reset by corresponding digital input (with OR if corresponding serial flag is enabled).

ENABLE = Reset is always ON.

ON will reset all faults, with the exception of Fault 4, 13, 112, which compel to re-start the inverter. Reset is also possible by I1, with Par.1.9.2 I1 RESET FAULT = YES.

Menu parameters description 1.10. TORQUE CONTROL

TORQUE CONTROL
1.10.

Group of parameters regulating the motor torque in vector control

MAX TORQUE	
1.10.1	200%

Max. motor torque in both signs.
In % of the nominal torque of the related motor

Setup range: from 0.% to a value related to motor/inverter coupling

TORQUE SOURCE	
1.10.2	AI3.

Assignes the motor torque adjusting source.

Setup range: REMOTE, AI1, AI2, AI3, AI4, AI5, MOTOPOT, OPERATOR.

REMOTE= Torque adjusting by a value tranferred in serial mode. Starting value= 0

AI1....AI5= Torque adjusting by the selected analog input.

The input 100% (+/-10VCD) corresponds to the value set in par.1.10.1 MAX TORQUE.

MOTOPOT= Torque adjusting by 2 digital inputs increase/decrease motopotentiometer-type.

Digital inputs must be set in par.1.10.8 and 1.10.9.

OPERATOR= Torque adjustment by the keyboard by par.1.10.14 SET TORQ OPERAT.

In any case max. torque adjusting corresponds to the value set in par.1.10.1 MAX TORQUE.

Caution !

Whatever the selected torque regulation source be, this one is active only if enabled by the commands programmed in par.1.10.5 IN DX ENABLE LIM and IN SX ENABLE LIM.

TORQUE CONTROL	
1.10.3	MAX _TORQ

Selects the motor torque control

Setup range: MAX_TORQ, SET_TORQ

MAX_TORQ= The torque is **limited** as max value, without sign, while the motor rotation direction is determined by the speed set source sign, selected in par.3.1.1.1 SPEED SOURCE.

(see MENU PARAMETERS DESCRIPTION 3.1.1 SPEED COMMANDS).

In this case, to enable the torque limitation it is necessary to set inputs (or flags in serial mode) ON, programmed in par.1.10.5 IN DX ENABLE LIM and 1.10.6 IN SX ENABLE LIM.

Each input which has been activated enables the torque limitation separately for each rotation direction.

Activate both inputs for torque limit in any case.

SET_TORQ= The torque is **set** with its sign; the torque sign determines the motor rotation direction, while speed is limited as max. value without sign in par.1.3.1 MAX MOTOR SPEED (see MENU PARAMETERS DESCRIPTION 3.1 SPEED LIMIT).

In this case, to enable the torque limitation it is necessary to set input (or flag in serial mode) ON, programmed in par.1.10.5 IN DX ENABLE LIM

RAMP TORQUE
1.10.4 1.0s

Torque set acceleration and deceleration ramp.

Setup range: from 0.1s to 300.0s

Caution !

By par.1.10.2 TORQUE SOURCE= REMORE, at rate activation, no torque ramp is performed.

IN DX ENABLE LIM
1.10.5 REMOTE

Assignes the torque limitation command in rightwards rotation (see description in par.1.10.3 TORQUE CONTROL)

Setup range: REMOTE, I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

IN SX ENABLE LIM
1.10.6 REMOTE

Assignes the torque limitation command in leftwards rotation (see description in par.1.10.3 TORQUE CONTROL)

Setup range: REMOTE, I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON.**

SAVE MOTOPOT.
1.10.7 YES

Enables or not saving in eeprom of the motopotentiometer torque setup at RUN command disabling (I1 OFF) and at inverter powering off.

Setup range: NO, YES

If NO is set, when powering up or at RUN command enabling, the reference torque setting starts from 0.

IN +TORQUE MOT.
1.10.8 REMOTE

Assignes the motopotentiometer torque set <u>increase</u> command

Setup range: REMOTE, I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

IN -TORQUE MOT.
1.10.9 REMOTE

Assignes the motopotentiometer torque set <u>decrease</u> command.

Setup range: REMOTE, I1, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

TORQUE THRESHOLD
1.10.10 100.%

Motor torque threshold in % to the motor nominal torque displayed in var.2.1.15 MOTOR TORQUE %

Setup range: from 0.% to 300.%

When the motor torque, with both signs, exceeds the threshold set in this parameter for the time period set in par.1.10.11 THRESHOLD DELAY, the output set in par.1.10.12 OUT TORQUE THRES is enabled.

THRESHOLD DELAY
1.10.11 5.0s

Intervention delay on the motor torque threshold set in par.1.10.10.

Setup range: from 0.1s to 30.0s

OUT TORQUE THRES
1.10.12 REMOTE.

Assignes a digital output to the threshold state on the motor torque set in par.1.10.10

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Motor torque > than par.1.10.10 + delay in par.1.10.11= ON output.

Motor torque < than par.1.10.10= OFF output

SAVE SET MANUAL	
1.10.13	YES

Enables or not saving in eeprom, at RUN stop (LI1 OFF) and when powering off, of the manual torque set by par.1.10.14 SET MAN....%)

Setup range: NO, YES

If NO is set, when powering up or at RUN command enabling, the torque setting starts from 0

SET TORQ OPERAT.	
1.10.14	

SET MAN	80.%
TORQUE	40.%

Includes manual setup by the keyboard of the motor torque and the real torque display.

It is an **OPERATOR type** parameter. See paragraph at the beginning of this Chapter "**BASIC DATA MENU in OPERATOR mode".**

SET MAN= Motor torque setup enabled only by par.1.10.2 TORQUE SOURCE= OPERATOR.

Setup range: from 0.% to the value set in par.1.10.1 MAX TORQUE.

TORQUE= Display of the real motor torque. Display range: from 0% to 300% of the motor nominal torque. It corresponds to var.2.1.15 MOTOR TORQUE %.

ADAPT PERC. TORQ.	
1.10.15	100.0%

Adaptation parameter to be set so as the 100% value displayed in var.2.1.15 MOTOR TORQUE % and in torque setups corresponds to the motor nominal torque.

Setup range: from 10.0% to 200.0%.

This parameter standard setup is 100%, which corresponds, in both scalar and vector control, to the torque of a motor whose power is equal to the max. nominal power of the inverter.

For a less powerful motor, an automatic adaptation of the display is performed, but the error could be consistent; in this case, it is necessary to modify the visualisation by setting this parameter as follows: e.g. If the torque displayed in par.2.1.15 MOTOR TORQUE % is 100%, while the real torque is 120% of the motor nominal torque, set par.1.10.15 ADAPT PERC TORQ.=120.0%

ADAPT TORQ. [Nm]	
1.10.16	100.0%

Adaptation parameter to be set so as the value dislayed in var.2.1.14 MOTOR TORQUE corresponds to the motor nominal torque in Nm

Setup range: from 10.0% to 200.0%.

This parameter standard setup is 100%, which corresponds, in both scalar and vector control, to the torque of a motor whose power is equal to the max. nominal power of the inverter.

For a less powerful motor, an automatic adaptation of the display is performed, but the error could be consistent; in this case, it is necessary to modify the visualisation by setting this parameter as follows: e.g. If the torque displayed in par.2.1.14 MOTOR TORQUE is 100.0Nm, while the real torque is 120.0Nm, set par.1.10.16 ADAPT TORQ.(Nm)=120.0%

IN EN.TORQ. FIL	
1.10.17	REMOTE

Gives the command enabling the Second order filter for torque pulse stabilization at low speed.

Setting field: REMOTE, I2 , I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE
REMOTE =Command **OFF** and no digit input assigned. Command **ON** possible with the relative serial flag only.
I2.....I14 = Assignment of the digit input selected (in OR with the relative serial flag).
ENABLE = Command always **ON**.
In addition to this, to enable the filter, it is necessary to activate the torque limitation by ON on both settable commands in parameters 1.10.5 IN DX ENABLE LIM and 1.10.6 IN SX ENABLE LIM .

TORQUE FIL	
1.10.18	5.0Hz

Cut-off frequency of the torque filter.

Setting field from 0.0 Hz to 100.0Hz
Lower is the frequency, more the pulses tend to stabilize; on the other side, the answer by the motor torque tends to slow down.
This cut-off frequency is kept from 0 to 1Hz of the frequency of the motor currents, over that range, is proportionally increased and excluded from the frequency of the motor currents set by par.1.10.19 F. STOP FIL.

F. STOP FIL	
1.10.19	25.0Hz

Frequency of the voltage on the motor, over this value the effect of the filter on the torque is canceled

Setting field from 0.0 Hz to 100.Hz

Menu parameters description 1.11. CURRENT CONTROL

CURRENT CONTROL 1.11. — ***Group of parameters controlling the current absorbed by the motor.***

CURRENT THRESHOL 1.11.1 5.0A — ***Motor current threshold on the value displayed in var.2.1.4 MOTOR CURRENT.***

Setup range: from 0.0A to 3000.0A

When the motor current exceeds the threshold set in this parameter for the time period set in par.1.11.2 THRESHOLD DELAY, the output set in par.1.11.3 OUT CUR THRESHOL is enabled

THRESHOLD DELAY 1.11.2 3.0s — ***Threshold intervention delay on the motor current, set in par.1.11.1***

Setup range: from 0.1s to 30.0s

OUT CUR THRESHOL 1.11.3 REMOTE — ***Assignes a digital output the threshold function on the motor current set in par.1.11.1.***

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Motor current > than par.1.11.1 + delay in par.1.11.2= ON output.

Motor current < than par.1.11.1= OFF output

RESET MAX Imax 1.11.4 YES — ***Resets 2.1.7 MEMO MAX Imax to ZERO***

Setup Range: YES, NO

If YES, it resets the var. 2.1.7 MEMO Imax to zero. YES lasts 2 seconds, then it turns back to NO.

Menu parameters description 1.12. PWM GENERATOR

PWM GENERATOR 1.12. — ***Group of parameters regulating the voltage sine wave generation on the motor by PWM logics (Pulse With Modulation).***

PWM FREQUENCY 1.12.1 5.00KHz — ***PWM frequency in vector control. As for scalar control, it represents the PWM frequency when the motor speed is higher that that set in par.1.12.3***

Setup range: from 0.5KHz to a value set in a standard parameter according to the inverter size. As for vectorial control, a min. 5KHz min. frequency is advised

START PWM FREQ. 1.12.2 0.50KHz — ***PWM frequency with motor speed lower than that set in par.1.12.3 CHANGE PWM SPEED (enabled only in scalar control).***

Setup range: from 0.5KHz to a value set in a standard parameter according to the inverter size.

CHANGE PWM SPEED 1.12.3 500.rpm — ***Threshold on the motor speed for the automatic PWM frequency change (enabled only in scalar control).***

Setup range: from 0.rpm to 30000.rpm.

When the motor speed set in ramp is below the threshold set in this parameter, the PWM frequency is that set in par.1.12.2 START PWM FREQ.

When the motor speed set in ramp exceeds the threshold set in this parameter, the PWM frequency is that set in par.1.12.1 PWM FREQUENCY

By setting the parameter at 0.rpm, the automatic PWM frequency change is disabled; in this case, the PWM frequency will be that set in par.1.12.1 PWM FREQUENCY.

The automatic PWM frequency change in scalar control is useful when big sized motors are driven and it is necessary to reduce the instability due to modulation pulses dead times; it is for this reason that at start a low PWM frequency is set (even 0.5Hz) in par.1.12.2, so as to improve the dead times internal compensation as well. Once the speed threshold set in par.1.12.3 CHANGE PWM SPEED has been exceeded, the PWM frequency can be higher (like e.g. 2KHz) and set in par.1.12.1, in order to reduce the current ripple on the motor.

Caution !

PWM frquencies over 5KHz causes the inverter derating, as explained in paragraph:

“Inverter derating according to PWM frequency”, in Chapter 5 TECHNICAL FEATURES.

Menu parameters description 1.13. BRAKE UNIT

BRAKE UNIT
1.13.

Group of parameters regulating the brake unit functioning for the dissipation of the energy regenerated by the motor on the resistor connected to F+ and F- terminals.

ENABLE
1.13.1 **YES**

Enables braking or not

Setup range: NO, YES

BRAKE RESISTANCE
1.13.2 **140.0 Ω**

Braking resistor ohmic value

Setup range: from 0.1ohm to 200.0ohm

NOMINAL CURRENT
1.13.3 **2.0A**

Braking resistor nominal current

Setup range: from 0.0A to 3000.0A

For braking resistors supplied by ROWAN EL., draw this information from the **"Table of braking resistors for Rowan inverters"**, in Chapter 8 BRAKING RESISTORS

5 SEC CURRENT
1.13.4 **3.3A**

Braking resistor max. current for 5s

Setup range: from 0.0A to 3000.0A

For braking resistors supplied by ROWAN EL., draw this information from the **"Table of braking resistors for Rowan inverters"**, in Chapter 8 BRAKING RESISTORS

Caution!

The inverter is equipped with an electronic control of the braking unit and its related resistor overload, so it is important to set the right resistors data, in order to avoid dangerous overheating of the same resistor. For further information, see Chapter 8 BRAKING RESISTORS

Menu parameters description 1.14. STALL FAULT

STALL FAULT
1.14.

Group of parameters setting the inverter block modes for current stall at U V W outputs (STALL FAULT).

STALL TIME
1.14.1 **5.000s**

Max. current stall time, exceeding which fault nr 11 STALL FAULT is enabled.

Setup range: from 0.000s to 30.000s

CURRENT LIMIT
1.14.2 **3000.0A**

Set the current level considered as fault

Setup range from 0.1A to 3000.0A

Menu parameters description 1.15. AUTORESTART

AUTORESTART
1.15.

Group of parameters setting the inverter autorestart after fault. Please see Chap.17, paragraph "Automatic re-start after a Fault" for Auto re-start loop description.

ENABLE
1.15.1 **NO**

Enables autorestarting or not after faults described in par. from 1.15.4 to 1.15.7.

Setup range: NO, YES

ATTEMPTS
1.15.2 **5.**

Sets the restarts max. nr

Setup range from1. to100.

RESTART DELAY
1.15.3 **3.0s**

Max. waiting time before restarting after a fault

Setup range from 0.1s to 300.0s

1° FAULT	
1.15.4	1.

1st fault resettable by restarting

Setup range: from 1 to 100 (see Chapter 17 FAULT INVERTER for faults list).

2° FAULT	
1.15.5	5.

2nd fault resettable by restarting

Setup range: from 1 to 100 (see Chapter 17 FAULT INVERTER for faults list).

3° FAULT	
1.15.6	6.

3rd fault resettable by restarting

Setup range: from 1 to 100 (see Chapter 17 FAULT INVERTER for faults list).

4° FAULT	
1.15.7	0.

4th fault resettable by restarting

Setup range: from 1 to 100 (see Chapter 17 FAULT INVERTER for faults list).

RESET TIME	
1.15.8	3600.s

Time period exceeding which the restart counter is cleared.
(See var.2.1.36 COUNT AUTORESTART in 2.1 GENERAL VARIABLE menu).

Setup range: from 0.s to 100000s

OUT RESTART END	
1.15.9	REMOTE

Assigns to a digital output to Auto re-start enabling activated if Auto restart loops attempts are equel to the number set in par. 1.15.2 ATTEMPTS

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE = No assigned Dig. Output for Auto re-start

O1 ... O8 = Anabling is assigned to the corresponding output.

ON = when maximum numbers of Auto re-start loops are reached (set in par. 1.15.2 ATTEMPTS), Fault12 AUTORESTART FAULT flags.

OFF = Only if the inverter is restarted manually.

If a not resetable fault happens, OUT RESTART END output is enabled.

Caution !

The fault reset function by RUN control (par.1.9.2 I1 RESET FAULT= YES), doesn't clear the autorestart counter, but only the restart delay time of par.1.15.3

Menu parameters description 1.16. DC BRAKING

DC BRAKING	
1.16.	

Group of parameters regulating the motor braking by direct current

DC BRAKE TIME	
1.16.1	10.0s

Direct current injection last

Setup range: from 0.1s to 300.0s

DC BRAKE LEVEL	
1.16.2	100.0%

Braking direct current in % on the motor nominal current in par.1.1.2 MOTOR NOM CURREN.

Setup range: from 0.0% to 300.0%

BRAKE LEVEL RAMP	
1.16.3	10.0s

Braking direct current set ramp.

Setup range: from 0.1s to 300.0s

DEFLUX TIME	
1.16.4	20.0s

Direct current injection delay

Setup range: from 0.2s to 30.0s

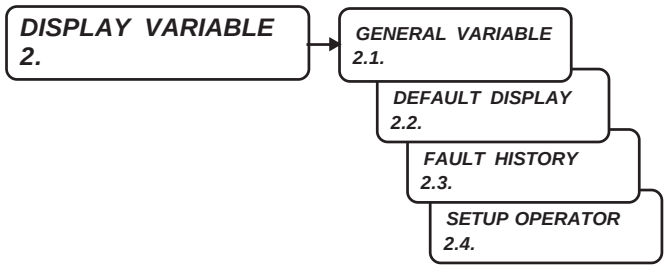
- ***Description of the motor braking cycle by direct current injection.***

The cycle must be enabled by par.1.9.3 I1 DC BRAKE= YES. In this way, when I1 input is disabled, after par.1.16.4 DEFLUX TIME delay, the direct current injection starts with the ramp set in par.1.16.3 BRAKE LEVEL RAMP, up to the value set in par.1.16.2 DC BRAKE LEVEL. In scalar control, the DC current injection last is = the time set in par.1.16.1 DC BRAKE TIME, while as for vector control, it stops automatically if the motor speed is 0rpm before this time has elapsed.

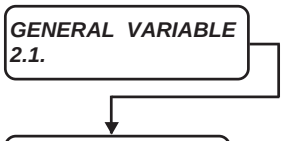
In any case, at the end of the braking cycle the inverter RUN is stopped.

Groups and menu description 2. DISPLAY VARIABLE

Menu 2.DISPLAY VARIABLE includes the menus of all basic functions display variables of both the inverter and the SPEED application



Display description of the menu 2.1. GENERAL VARIABLE



It includes the display variables which are always enabled in the inverter, indepentently from the enabled application (e.g. SPEED, AXIS, WINDER).
Among these variables (and those of the enabled application described in the specific manual), 10 visualisations can be chosen to be included in DISPLAY STATUS by menu par.2.2 DEFAULT DISPLAY

Speed reference set without ramp

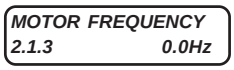
Display range: from -30000.rpm to +30000rpm

The preset speed display is enabled in RUN command OFF as well, but the value is zero if the command selected by the par.3.1.1.2 IN STOP SPEED (stop in ramp) is enabled.

Motor speed

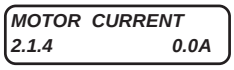
Display range: from -30000.rpm to +30000rpm

In scalar mode, the speed is estimated, while in vector mode it corresponds to the real motor speed.



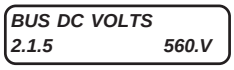
Voltage frequency on the motor

Display range: from 0.0Hz to 800.0Hz.



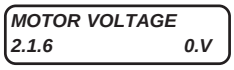
Motor absorbed current

Display range: from 0.0A to 3000.0A



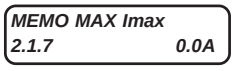
BUSDC voltage on F+ and - terminals

Display range: from 0.V to 3000.V



Motor voltage

Display range: from 0.V to 3000.V

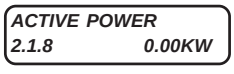


Store the highest istantaneous maximum motor current value (Imax).
Imax is displayed in var.2.1.49 I MAX MONITOR

Display range: from 0.0A to 3000.0A.

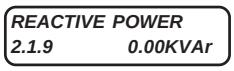
This value is stored into the eeprom when inverters shuts down and then is reloaded again at the restart.

This information indicates the maximum current that is reached in the functioning period, or the current value that has cuased a particular fault. This variable can be reset by par.1.11.4 RESET MAX Imax



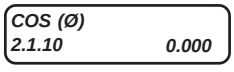
Active power absorbed by the motor

Display range: from 0.00KW to 900.00KW



Reactive power absorbed by the motor

Display range: from 0.00KWAr to 900.00KWAr



Cosine of Voltage/motor current phase angle

Display range: from 0.000 to 1.000.

I x COS (Ø)	
2.1.11	0.0A

Motor absorbed current multiplied to the cosine of voltage/current phase angle.

Display range: from 0.0A to 3000.0A

MOTOR SLIP V/F	
2.1.12	0.rpm

Motor speed slip in scalar control, when compensation is enabled by par.1.5.17 SLIP COMP ENABLE= YES

Display range: from 0 rpm to 1000rpm

CALC MOTOR TORQ.	
2.1.13	0.0Nm

Estimated motor torque enabled, only in scalar control

Display range: from 0.0Nm to 10000.0Nm

MOTOR TORQUE	
2.1.14	0.0Nm

Real motor torque in Nm, enabled only in vector control

Display range: from 0.0Nm to 10000.0Nm

Caution !

This display is correct only if a motor with power = the inverter max. nominal power. If a less powerful motor is used, it is necessary to set again par.1.10.16 ADAPT TORQ [Nm], or the displayed torque doesn't correspond to reality. In this case you can contact ROWAN EL

MOTOR TORQUE %	
2.1.15	0.%

Real motor torque in %, in vector control

Display range: from 0.% to 100.%

Caution !

This display is correct only if a motor with power = the inverter max. nominal power. If a less powerful motor is used, it is necessary to set again par.1.10.15 ADAPT PERC TORQ, or the displayed torque doesn't correspond to reality. In this case you can contact ROWAN EL.

LAST FAULT	
2.1.16	0.

Last fault causing the inverter block

Display range: from 0. to 100.

To understand the fault type linked to this nr, please see Chapter 17 INVERTER FAULTS AND ALARMS.

Caution !

After each restart, the faults nr in this variable is reset. However, the last fault is memorised in par.2.3.1 FAULT from the FAUL HISTORY menu

INVERTER I x I	
2.1.17	100.%

Medium current on the inverter U V W terminals squared, calculated on a 300sec. control window

Display range: from 0.% to 10000.%

Use the display to calculate the % value referred to the inverter nominal current: **In%=** $\sqrt{\text{var.2.1.17}}$ **x 10**

In% = **100% %** corresponds to the NOMINAL CURRENT IN U-V-W OUTPUT as described in the "SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 400", in Chapter TECHNICAL FEATURES.

MOTORI x I	
2.1.18	100.%

Medium current absorbed by the motor squared, calculated on a 300sec. control window

Display range: from 0.% to 10000.%

Use the display to calculate the % value referred to the motor rated current **In%=** $\sqrt{\text{var.2.1.18}}$ **x 10**

In% = **100%** is the motor nominal current set in par.1.1.2 MOTOR NOM CURREN.

IGBT BRAKE CURR.	
2.1.19	0.0A

Current absorbed by the braking resistor connected to F and F+ terminals

Display range: from 0.0A to 3000.0A

The visualized current is not directly measured but it is deducted basing on the resistive value set into par.1.13.2 BRAKE RESISTANCE and on the measured value of the Bus DC, visualized even by the var. 2.1.5 BUSDC VOLTS; the calculation of the current doesn' take into consideration the parasite impedance characteristic of the wire resistors, for this reason, mostly with very low duty cycles, the value visualized could reach a maximum error of +10% in spite of the real one.

DIG. INPUT I1..8	
2.1.20	11000001.

Binary visualisation of the digital inputs from I1 to I8 status.

Display range: from 0 to 255 BINARY.

The inputs state corresponds to that of each bit: 1= input ON, 0= input OFF.

The first bit on the right is related to I1 input and so on leftwards up to I8.

e.i. if par.2.1.20= 11000001, I1, I7 and I8 digital inputs are ON. All left are OFF.

DIG. INPUT I9 . 14
2.1.21 00100100.

Binary visualisation of the digital inputs from I9 to I14 status

Display range: from 0 to 63 BINARY.
The inputs state corresponds to that of each bit: 1= input ON, 0= input OFF.
The first bit on the right is related to I9 input and so on leftwards up to I14.
e.i. if par.2.1.21= 00100100, I11 and I14 digital inputs are ON. All left are OFF

DIG. OUTPUT O1.8
2.1.22 00000101.

Binary visualisation of the digital outputs from O1 to O8 status

Display range: from 0 to 255 BINARY.
The outputs state corresponds to that of each bit: 1= output ON, 0= output OFF.
O1, O2, O3 relay outputs, 1= energized coil, 0= deenergized coil.
The first bit on the right is related to O1 output and so on leftwards up to O8.
e.i. if par.2.1.21= 00000101, O1 and O3 digital outputs are ON. All left are OFF

ANALOG INPUT AI1
2.1.23 100.00%

Signal display in % on analog input AI1.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI2
2.1.24 100.00%

Signal display in % on analog input AI2.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI3
2.1.25 100.00%

Signal display in % on analog input AI3.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI4
2.1.26 100.00%

Signal display in % on analog input AI4.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI5
2.1.27 100.00%

Signal display in % on analog input AI5.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI6
2.1.28 100.00%

Signal display in % on analog input AI6.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI7
2.1.29 100.00%

Signal display in % on analog input AI7.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI8
2.1.30 100.00%

Signal display in % on analog input AI8.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ANALOG INPUT AI9
2.1.31 100.00%

Signal display in % on analog input AI9.

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated).

ACTIVE VAR AO0
2.1.32 100.00%

Signal display in % on analog output AO0.

Display range: from -100.00% to +100.00% (max. values, exceeding which the output gets saturated).

ACTIVE VAR AO1
2.1.33 100.00%

Signal display in % on analog output AO1.

Display range: from -100.00% to +100.00% (max. values, exceeding which the output gets saturated).

ACTIVE VAR AO2
2.1.34 100.00%

Signal display in % on analog output AO2.

Display range: from -100.00% to +100.00% (max. values, exceeding which the output gets saturated).

ACTIVE VAR AO3	
2.1.35	100.00%

Signal display in % on AO3 analog output

Display range: from -100.00% to +100.00% (max. values, exceeding which the input gets saturated.

COUNT AUTORESTAR	
2.1.36	0.

Autorestart counter for the automatic autorestart function.

Display range: from 0. to 100.

As for this variable function, see Menu parameters description 1.15 AUTORESTART

MOTOR CONTROL I	
2.1.37	0.0A

Motor current in vector control

Display range: from 0.0A to 3000.0A.

FIRMWARE VERSION	
2.1.38	497 01.06

① ② ③

Inverter firmware version

Display field from 0.00 to 999999.99 shared in 3 parts:
1) number of firmware version; **2)** Active applications (Ex. 01= "SPEED + AXIS" active applications, see also chap.18)
3) additional number of the firmware version referring to firmware modifications that do not make changes on parameters.

OPERATE HOURS	
2.1.39	51.26h

Inverter functioning time in RUN

Display range: from 0.00 hours to 100000.00 hours.

HARDWARE VERSION	
2.1.40	15 00

① ②

Inverter hardware version

display range from 0.00. to 300.00 shared in 2 parts:
1) number of the drive size: 10=/P, 15=/R, 20=/0, 22=/0M, 25=/1, 30=/L, 35=/2, 38=/2,5, 40=/3, 45=/3.5, 50=/4, 55=/5, 60=/6, 65=/6.5, 70=/7, 75=/8, 80=/8.5, 85=/9, 90=/A, 95=/B, 100=/C, 105=/D, 110=/E, 115=/F, 120=/G.
2) version of parameters configuration.

LAST RESTORE	
2.1.41	DEFAULT.

It displays the last parameters memory loaded in WORK MEMORY

Display range: from 0. to 2.

0= DEFAULT memory, 1= SETUP_1 memory, 2= SETUP_2 memory

See paragraph “Possible operations with parameters memories”, in Chapter 11 PARAMETERS TRANSFER.

POWER LOSS COUNT	
2.1.42	0.

Voltage dips counter.

Display range: from 0. to 30000.

See the **Menu parameters description 1.8 POWER LOSS CNTR** for functioning in case of voltage dips.

LAST TWO ERR COM	
2.1.43	XXYY.

It includes the identification number of the last 2 errors in serial communications. YY= last error nr, XX= previous error nr

Display range: from 0. to 9999.

The value can be reset by par.5.2.6 RESET ERR. COUNT

See the manual INVERTER 400 SERIAL TRANSMISSION for faults descriptions

COUNT ERRORS COM	
2.1.44	0.

Error counter in serial communications

Display range: from 0. to 32000.

The counter can be reset by par.5.2.6 RESET ERR. COUNT

SET TORQUE %	
2.1.45	0.%

Visualization of the active torque reference, in % on the nominal torque. It's active only in vector control.

Display range: from 0.% to 300.%.

ENCODER SPEED	
2.1.46	0.rpm

Speed of the encoder selected for vector control (ENCODER1 or ENCODER2).

Display range: from -30000.rpm to +30000.rpm

The display is enabled in scalar control as well.

SET	80.%
TORQUE	40.%

Var.2.1.47. Includes the torque set and the motor torque display in case of manual setup by the keyboard (par.1.10.2 TORQUE SOURCE= OPERATOR).

SET= torque set display in % on the nominal motor torque set by par.1.10.14 SET MAN.....%

TORQUE= displays the motor torque in % on the nominal torque. It corresponds to var.2.1.15 MOTOR TORQUE % visualisation

SET OPER	300.rpm
SPEED	300.rpm

Var.2.1.48. Includes the speed set and the motor speed display in case of manual setup by the keyboard (par.3.1.1.1 SPEED SOURCE= OPERATOR).

SET OPER= speed set display set by par.3.1.9.2 SET MAN OPER.....rpm

SPEED= displays the motor speed. It corresponds to var.2.1.2 MOTOR SPEED visualisation.

I MAX MONITOR	
2.1.49	0.0A

Max. motor current in scalar and vector function

Display range: from 0.0A to 3000.0A.

Each second displays the max. current peak from a 1sec display window.

This display enables to detect even a single current peak of 50microseconds last, keeping it visualised for 1sec. So it helps verifying the edge during overloading before the protection FAULT 1 (MAX PEAK CURRENT) intervenes.

INVERTER ALARM	
2.1.50	NONE

Last active alert display (fault light flashing)

String display range: NONE, CAP_LIFE, PROG_IN, PROG_OUT, AXIS_LIM, NO_PHASE.

See Chapter 17 FAULTS AND ALARMS for alarms description.
For the AXIS_LIM, NO_PHASE alarms see the specific MANU.400A AXIS manual.

ANYBUS TYPE	
2.1.51	NONE

It displays the "ANYBUS" serial communication module

Display field: NONE, CAN_OPEN, PROFIBUS, MODB_TCP, ETHERCAT, PROFINET

ANYBUS STATE	
2.1.52	SETUP

It displays the state of the "ANYBUS" serial communication module

Display field: SETUP, NW_INIT, PROCESS, IDLE, PROCESS_ACTIVE, ERROR, EXCEPTION.
For the functioning description, see the MANU.400TS serial communication manual .

ROTOR K CORR	
2.1.53	1.00

Proportional correction factor determined from the constant rotoric algorithm

Display field: from 0.25 to 2.00.
During the vector control operation with the algorithm of rotor constant correction enable (par.1.7.1 ENABLE EST TAUR = YES) the setup value in par.1.6.5 ROTOR CONSTANT will be moltiply for the value, display in this parameter.

IP ADDRESS	
2.1.54	192.168.1.100

Current IP address of the drive.
Active just in case of use Optional serial module "ANYBUS MODBUS TCP/IP".

Display field: from 000.000.000.000 to 255.255.255.255

Menu parameters description 2.2 DEFAULT DISPLAY

DEFAULT DISPLAY 2.2.

It includes those parameters enabling to select the DISPLAY STATUS variables (max. 10 visualisations).

DEFAULT DIS1 2.2.1 2.1.1

It selects the order nr of the variable to be included as 1st visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS2 2.2.2 2.1.2

It selects the order nr of the variable to be included as 2nd visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS3 2.2.3 2.1.3

It selects the order nr of the variable to be included as 3rd visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS4 2.2.4 2.1.4

It selects the order nr of the variable to be included as 4th visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS5 2.2.5 2.1.46

It selects the order nr of the variable to be included as5th visualisation

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS6 2.2.6 2.1.5

It selects the order nr of the variable to be included as 6h visualisation

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS7 2.2.7 2.1.15

It selects the order nr of the variable to be included as7th visualisation

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS8 2.2.8 2.1.49

It selects the order nr of the variable to be included as 8th visualisation

Setup range for SPEED application: 2.1.1,.....2.1.50.

DEFAULT DIS9 2.2.9 2.1.16

It selects the order nr of the variable to be included as 9th visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50

DEFAULT DIS10 2.2.10 2.1.38

It selects the order nr of the variable to be included as 10th visualisation.

Setup range for SPEED application: 2.1.1,.....2.1.50

For different applications (par.100.5 APPLICATION, set differently from SPEED), the setup range for parameters DEFAULT DIS1...DIS10 is described in the manuals enclosed.

Caution !

In paragraph **"DISPLAY STATUS description"** at the beginning of this Chapter, the process to change default visualisations is described.

Menu parameters description 2.3. FAULT HISTORY

FAULT HISTORY
2.3.

It includes the last 10 faults display.

FAULT 1
2.3.1 0.

It displays the nr of the 1st fault (the last one).

Display range: from 0. to 100

FAULT 2
2.3.2 0.

It displays the nr of the 2nd fault

Display range: from 0. to 100

FAULT 3
2.3.3 0.

It displays the nr of the 3rd fault

Display range: from 0. to 100

FAULT 4
2.3.4 0.

It displays the nr of the 4th fault

Display range: from 0. to 100

FAULT 5
2.3.5 0.

It displays the nr of the 5th fault

Display range: from 0. to 100

FAULT 6
2.3.6 0.

It displays the nr of the 6h fault

Display range: from 0. to 100

FAULT 7
2.3.7 0.

It displays the nr of the 7h fault

Display range: from 0. to 100

FAULT 8
2.3.8 0.

It displays the nr of the 8th fault

Display range: from 0. to 100

FAULT 9
2.3.9 0.

It displays the nr of the 9th fault

Display range: from 0. to 100

FAULT 10
2.3.10 0.

It displays the nr of the 10th fault (less recent).

Display range: from 0. to 100

See Chapter 17 INVERTER FAULTS AND ALARMS for fault list and related description.

Menu parameters description 2.4. SETUP OPERATOR

SETUP OPERATOR 2.4.

It includes those parameters enabling to select OPERATOR-type options, to be activated into BASIC DATA menu in OPERATOR mode.

OPERATOR SET1 2.4.1 1.10.14

It selects the order nr of the parameter to be included as 1st option.

Setup range for SPEED application: 1.10.14, 3.1.9.2.

OPERATOR SET2 2.4.2 3.1.9.2

It selects the order nr of the parameter to be included as 2nd option.

Setup range for SPEED application: 1.10.14, 3.1.9.2.

OPERATOR SET3 2.4.3 3.1.9.2

It selects the order nr of the parameter to be included as 3rd option.

Setup range for SPEED application: 1.10.14, 3.1.9.2.

OPERATOR SET4 2.4.4 3.1.9.2

It selects the order nr of the parameter to be included as 4th option.

Setup range for SPEED application: 1.10.14, 3.1.9.2.

OPERATOR SET5 2.4.5 3.1.9.2

It selects the order nr of the parameter to be included as 5th option.

Setup range for SPEED application: 1.10.14, 3.1.9.2.

ACTIVE SET OPER. 2.4.6 2.

It selects the max. nr of OPERATOR-type parameter to be enabled into the starting BASIC DATA menu.

Setup range: from 1. to 5.

1= only 1st option enabled, 2= only 1st and 2nd options enabled, ..., 5= all options enabled.

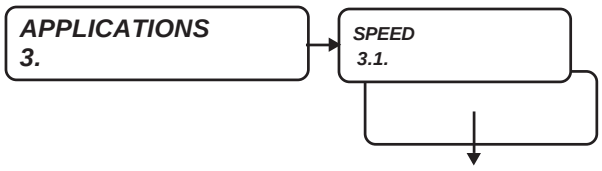
For different applications (par.100.5 APPLICATION, set differently from SPEED), the setup range for parameters OPERATOR SET1.... SET5 is described in the manuals enclosed.

Caution !

In paragraph **"BASIC DATA menu in OPERATOR mode"** at the beginning of this Chapter, the process to customize the keyboard basic options is described

Groups and menu description 3. APPLICATIONS

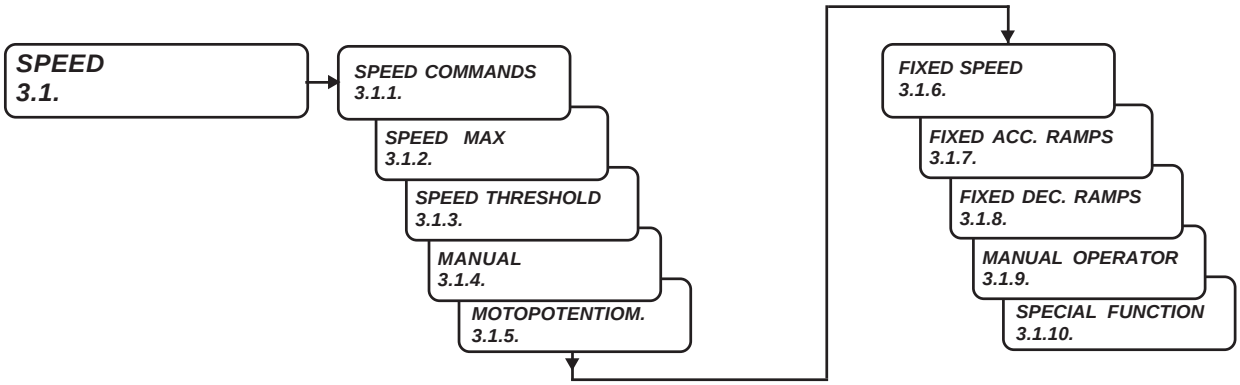
Menu 3. APPLICATIONS includes the parameters of those menus enabling all possible applications of this inverter.



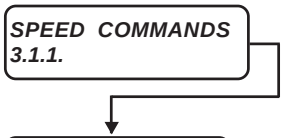
For other applications available besides SPEED, see the specific manual enclosed (see Chapter 20).

Groups and menu description 3.1 SPEED

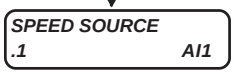
Menu 3.1 SPEED includes the parameters of those menus setting the basic application functioning: MOTOR SPEED CONTROL.



Menu parameters description 3.1.1 SPEED COMMANDS



It includes the parameters enabling some features on the speed set.



Par.3.1.1.1. Assignes the motor speed adjusting source

Setup range: REMOTE, AI1, AI2, AI3, AI4, AI5, MOTOPOT, OPERATOR.

REMOTE= Speed adjusting by a value tranferred in serial mode. Starting value= 0

AI1....AI5= Speed adjusting by the selected analog input.

The input 100% (+/-10VCD) corresponds to the value set in par.1.3.1 MAX MOTOR SPEED.

When a +/-10VCD analog input is assigned (par.TYPE INPUT= -10Vdc / +10Vdc), the signal polarity determines the motor rotation speed, both in scalar and in vector control; **in this case, in order to avoid an irregular functioning with 0Vdc analog reference, it is advised to set par.1.3.2 MIN MOTOR SPEED= 0rpm.**

MOTOPOT= Speed adjusting by 2 digital inputs increase/decrease as motopotentiometer.

Digital inputs must be set in par.3.1.5.1 IN INCREASE MOT and 3.1.5.2 IN DECREASE MOT.

OPERATOR= Speed adjustment by keyboard by par.3.1.9.2 SET MAN OPERATOR.

In any case the max. adjusting corresponds to the value set in par.1.3.1 MAX MOTOR SPEED.

Par. 3.1.1.2. Assignes the STOP IN RAMP command.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

STOP IN RAMP command:

ON= the motor is brought to at 0rpm with active deceleration ramp.

OFF= the motor is brought up to the set speed with active acceleration ramp.

Par. 3.1.1.3. Assignes the ROTATION DIRECTION INVERSION command.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

ROTATION DIRECTION INVERSION command:

ON= the motor reverse its rotation direction compared to the present speed reference sign.

OFF= the motor direction according to the present speed reference sign.

Menu parameters description 3.1.2 SPEED MAX

SPEED MAX
3.1.2.

It includes those parameters enabling the binary selection of 3 motor max. speed limits, in absolute value for both rotation directions.

SET SPEED MAX1
.1 1250.rpm

Par.3.1.2.1. Setup of max. speed limit N.1

Setup range: from 30.rpm to 24000.rpm

SET SPEED MAX2
.2 1000.rpm

Par. 3.1.2.2. Setup of max. speed limit N.2.

Setup range: from 30.rpm to 24000.rpm

SET SPEED MAX3
.3 750.rpm

Par. 3.1.2.3. Setup of max. speed limit N.3.

Setup range: from 30.rpm to 24000.rpm

IN1 SPEED MAX
.4 REMOTE

Par. 3.1.2.4. **Assignes a command for the binary selection of max. speed limits from N.1 to N.3.**

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

IN2 SPEED MAX
.5 REMOTE

Par. 3.1.2.5. Assignes a command for the binary selection of max. speed limits from N.1 to N.3.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

Max. speed limits selection modes:

IN1 SPEED MAX	IN2 SPEED MAX	BINARY COMBINATION RESULT
OFF	OFF	Max. speed limit by par.1.3.1 MAX MOTOR SPEED
ON	OFF	Max. speed limit by par.1.3.2.1 SET SPEED MAX 1
OFF	ON	Max. speed limit by par.1.3.2.2 SET SPEED MAX 2
ON	ON	Max. speed limit by par.1.3.2.3 SET SPEED MAX 3

Menu parameters description 3.1.3. SPEED THRESHOLD

SPEED THRESHOLD
3.1.3.

It includes the parameters enabling the motor speed thresholds

SPEED THRESHOLD1
.1 100.rpm

Par.3.1.3.1. Threshold N.1 on the motor speed displayed in var.2.1.2 MOTOR SPEED.

Setup range: from 0.rpm to 30000.rpm

THRESHOLD1 DELAY
.2 0.0s

Par.3.1.3.2. N.1 threshold intervention delay on the motor speed.

Setup range: from 0.1s to 30.0s

OUT THRESHOLD1
.3 O1

Par.3.1.3.3. Assignes a digital output the N.1 threshold state

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Motor speed > than par.3.1.3.1 + delay in par.3.1.3.2= ON output; Motor speed < than par.3.1.3.1= OFF output.

SPEED THRESHOLD2
.4 1500.rpm

Par.3.1.3.4. N.2 threshold on the motor speed displayed in var.2.1.2 MOTOR SPEED

Setup range: from 0.rpm to 30000.rpm

THRESHOLD2 DELAY
.5 1.0s

Par.3.1.3.5. N.2 threshold intervention delay on the motor speed.

Setup range: from 0.1s to 30.0s

OUT THRESHOLD2
.6 REMOTE

Par.3.1.3.6. Assignes a digital output the N.2 threshold state on the motor speed

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output:

Motor speed > than par.3.1.3.4 + delay in par.3.1.3.5= ON output.

Motor speed < than par.3.1.3.4= OFF output.

SPEED THR. STOP
.7 0.rpm

Par. 3.1.3.7. Threshold on the speed set for the ramp stop function

Setup range: from 0.rpm to 300.rpm
When the set speed is reduced, in absolute value, below the value of this parameter, it runs an internal command that stops in ramp, this function is typically used to prevent that the motor rotates even when the speed reference from analog input is set to zero (caused by the analog input offset).
Setting the value to 0 the function is excluded.

Menu parameters description 3.1.4 MANUAL

MANUAL
3.1.4.

It includes the parameters enabling and adjusting the motor speed manual commands.

MANUAL SPEED
.1 300.rpm

Par.3.1.4.1. Speed set in manual commands or in JOG commands.

Setup range: from 0.rpm to the value set in par.1.3.1 MAX MOTOR SPEED.

IN ENABLE MANUAL
.2 REMOTE

Par.3.1.4.2. Assignes the JOG commands enabling.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Command ON= JOG enabled; Command OFF= JOG disabled.

IN JOG +
.3 REMOTE

Par.3.1.4.3. Assignes the manual JOG commands with positive rotation direction (counterclockwise, see from shaft side).

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Command ON= JOG + (if enabled); Command OFF= STOP

IN JOG -
.4 REMOTE

Par.3.1.4.4. Assignes the manual JOG commands with negative rotation direction (clockwise, see from shaft side).

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Command ON= JOG + (if enabled); Command OFF= STOP

Menu parameters description 3.1.5 MOTOPOTENTIOM

MOTOPOTENTIOM. 3.1.5.

It includes the parameters which determine the speed reference functioning by motopotentiometer-type command, which are ON if par.3.1.1 SPEED SOURCE = MOTOPOT

SAVE MOTOPOT. .1 YES

Par.3.1.5.1. Enables or not saving in eeprom of the motopotentiometer speed setup at RUN stop (I1 OFF) and when powering off.

Setup range: NO, YES

If NO is set, when powering up or at rate start, the setup starts from 0.

IN INCREASE MOT .2 REMOTE

Par.3.1.5.2. Assignes the motopotentiometer speed reference <u>increase</u> command..

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

IN DECREASE MOT .3 REMOTE

Par.3.1.5.3. Assignes the motopotentiometer speed reference <u>decrease</u> command.

Setting range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

ACC DEC MOTP SET .4 10.00s

Par. 3.1.5.4. Setting of acceleration/deceleration ramps on speed reference from motopotentiometer.

Setup range: from 0.01s to 600.00s.

MOTOPOTENTIOMETER FUNCTIONING:

By the INCREASE command ON, the set increases slowly for the first 3s with a 300s fixed ramp; then with an active acceleration ramp setting by **par.3.1.5.4 ACC DEC MOTP SET**. Idem for DECREASE command for decreasing setup

Menu parameters description 3.1.6 FIXED SPEED

FIXED SPEED 3.1.6.

It contains the parameters enabling the binary selection of 7 fixed speeds.

SET SPEED 1 .1 500.rpm

Par.3.1.6.1. Setup of fixed speed N.1

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 2 .2 1000.rpm

Par. 3.1.6.2. Setup of fixed speed N.2.

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 3 .3 -500.rpm

Par. 3.1.6.3. Setup of fixed speed N.3.

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 4 .4 1500.rpm

Par. 3.1.6.4. Setup of fixed speed N.4.

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 5 .5 -750.rpm

Par. 3.1.6.5. Setup of fixed speed N.5.

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 6
.6 -1500.rpm

Par. 3.1.6.6. Setup of fixed speed N.6.

Setup range: from -30000.rpm to 30000.rpm

SET SPEED 7
.7 -1000.rpm

Par. 3.1.6.7. Setup of fixed speed N.7.

Setup range: from -30000.rpm to 30000.rpm

IN1 SPEED
.8 I3

Par.3.1.6.8. Assignes a command for the binary selection of fixed speeds from N.1 to N.7.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

IN2 SPEED
.9 I4

Par. 3.1.6.9. Par.3.1.1.9. Assignes a command for the binary selection of fixed speeds from N.1 to N.7.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

IN3 SPEED
.10 REMOTE

Par.3.1.6.10. Assignes a command for the binary selection of fixed speeds from N.1 to N.7.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Max. fixed speeds selection modes:

IN1 SPEED	IN2 SPEED	IN3 SPEED	BINARY COMBINATION RESULT
OFF	OFF	OFF	Speed reference by source set in par.3.1.1.1 SPEED SOURCE
ON	OFF	OFF	Speed reference by fixed speed set in par.3.1.6.1 SET SPEED 1
OFF	ON	OFF	Speed reference by fixed speed set in par.3.1.6.2 SET SPEED 2
ON	ON	OFF	Speed reference by fixed speed set in par.3.1.6.3 SET SPEED 3
OFF	OFF	ON	Speed reference by fixed speed set in par.3.1.6.4 SET SPEED
ON	OFF	ON	Speed reference by fixed speed set in par.3.1.6.5 SET SPEED 5
OFF	ON	ON	Speed reference by fixed speed set in par.3.1.6.6 SET SPEED 6
ON	ON	ON	Speed reference by fixed speed set in par.3.1.6.7 SET SPEED 7

Menu parameters description 3.1.7. FIXED ACC. RAMPS

FIXED ACC. RAMPS
3.1.7.

It contains the parameters enabling the binary selection of 3 acceleration ramps on the motor speeds set.

SET ACC1
.1 1.00s

Par. 3.1.7.1. Setup of acceleration ramp N.1.

Setup range: from 0.01s to 600.00s

SET ACC2
.2 2.00s

Par. 3.1.7.2. Setup of acceleration ramp N.2

Setup range: from 0.01s to 600.00s

SET ACC3
.3 3.00s

Par. 3.1.7.3. Setup of acceleration ramp N.3.

Setup range: from 0.01s to 600.00s

IN1 ACC
.4 I5

Par.3.1.7.4. Assignes a command for the binary selection of acceleration ramps from N.1 to N.3.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**

IN2 ACC

Par.3.1.7.5. Assignes a command for the binary selection of acceleration ramps from N.1 to N.3.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Fixed acceleration ramps selection modes :

IN1 ACC	IN2 ACC	BINARY COMBINATION RESULT
OFF	OFF	Acceleration ramp by par.1.2.1 RAMP ACCEL.TIM
ON	OFF	Acceleration ramp by par. 3.1.7.1 SET ACC1
OFF	ON	Acceleration ramp by par. .1.7.2 SET ACC2
ON	ON	Acceleration ramp by par. 3.1.7.3 SET ACC3

Menu parameters description 3.1.8. FIXED DEC. RAMPS

FIXED DEC. RAMPS
3.1.8.

It contains the parameters enabling the binary selection of 3 deceleration ramps on the motor speeds set.

SET DEC 1
.1 1.00s

Par. 3.1.8.1. Setup of deceleration ramp N. 1.

Setup range: from 0.01s to 600.00s

SET DEC 2
.2 2.00s

Par. 3.1.8.2. Setup of deceleration ramp N.2.

Setup range: from 0.01s to 600.00s

SET DEC 3
.3 3.00s

Par. 3.1.8.3. **Setup of deceleration ramp** ***N.3.***

Setup range: from 0.01s to 600.00s

IN1 DEC
.4 I5

Par.3.1.8.4. Assignes a command for the binary selection of deceleration ramps from N.1 to N.3

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

IN2 DEC
.5 REMOTE

Par.3.1.8.5. Assignes a command for the binary selection of deceleration ramps from N.1 to N.3.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned. Command **ON** is possible only by its related serial flag.

I2...I14= Assignation of the command to the selected digital input (in OR by the related serial flag).

ENABLE= Command always **ON**.

Fixed deceleration ramps selection modes:

IN1 DEC	IN2 DEC	BINARY COMBINATION RESULT
OFF	OFF	Acceleration ramp by par. 1.2.2 RAMP DECEL. TIME
ON	OFF	Acceleration ramp by par. 3.1.8.1 SET DEC 1
OFF	ON	Acceleration ramp by par.3 .1.8.2 SET DEC 2
ON	ON	Acceleration ramp by par. 3.1.8.3 SET DEC 3

Menu parameters description 3.1.9. MANUAL OPERATOR

MANUAL OPERATOR
3.1.9.

It contains the parameters enabling the speed manual setup by the keyboard in OPERATOR mode.

SAVE MAN OPERAT.
.1 YES

Par. 3.1.9.1. When powering off, it enables or not saving in eeprom of the speed manual setup by par. 3.1.9.2 SET OP.....rpm

Setup range: NO, YES

SET MAN OPERATOR
.2

Par. 3.1.9.2 It includes the keyboarded manual setup of the motor speed and the real speed display.

It is an **OPERATOR-type** parameter. See paragraph at the beginning of this Chapter: "**BASIC DATA MENU in OPERATOR mode".**

SET OP 300.rpm
SPEED 0.rpm

SET OP= Motor speed setup enabled only by par.3.1.1.1 SPEED SOURCE= OPERATOR.

Setupg range: from -30000.rpm to 30000.rpm

SPEED= Display of the real motor speed. It corresponds to var.2.1.2 MOTOR SPEED display

Menu parameters description 3.1.10. SPECIAL FUNCTION

SPECIAL FUNCTION
3.1.10.

It includes the parameters for the special function selecting 2 different motors by a single inverter.

MOTOR ENABLE OUT
.1 MOT_1

Par. 3.1.10.1. . It selects the enabled motor

Setup range: MOT_1, MOT_2.

OUT ENABLE MOT1
.2 REMOTE

Par.3.1.10.2. Assignes a digital output the motor 1 contactor (MOT_1)

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

O1…O8= Assignation of the state to the selected output

OUT ENABLE MOT2
.3 REMOTE

Par.3.1.10.3. Assignes a digital output the motor 2 contactor (MOT_2)

Setup range: REMOTE, O1, O2, O3, O4, O5, O6, O7, O8.

REMOTE= no output assigned

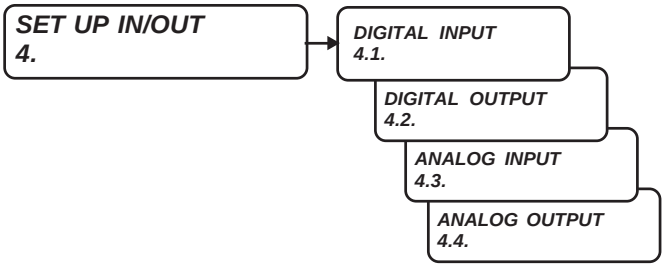
O1…O8= Assignation of the state to the selected output.

In Chapter 16, paragraph **"Selection of two vector motors controlled by the same drive"**, this function is explained**.**

Groups and menu description 4. SET UP IN/OUT

The menu 4. SET UP IN/OUT includes the adaptation parameter menus of all digital and analog inputs/outputs.

See paragraph **"Function assignation to INPUT/OUTPUT resources**" in Chapter 14 for functions assignation to I/O resources



Groups and menu description 4.1. DIGITAL INPUT

DIGITAL INPUT
4.1.

It includes adaptation parameters for each digital input with the following setup range:
NO= not inverted input
YES= inverted input

INVERT I2 4.1.1	NO	*I2 Digital input adaptation.*
INVERT I3 4.1.2	NO	*I3 Digital input adaptation.*
INVERT I4 4.1.3	NO	*I4 Digital input adaptation.*
INVERT I5 4.1.4	NO	*I5 Digital input adaptation.*
INVERT I6 4.1.5	NO	*I6 Digital input adaptation.*
INVERT I7 4.1.6	NO	*I7 Digital input adaptation.*
INVERT I8 4.1.7	NO	*I8 Digital input adaptation.*
INVERT I9 4.1.8	NO	*I9 Digital input adaptation.*
INVERT I0 4.1.9	NO	*I10 Digital input adaptation.*
INVERT I11 4.1.10	NO	*I11 Digital input adaptation.*
INVERT I12 4.1.11	NO	*I12 Digital input adaptation.*
INVERT I13 4.1.12	NO	*I13 Digital input adaptation.*
INVERT I14 4.1.13	NO	*I14 Digital input adaptation.*

Menu parameters description 4.2. DIGITAL OUTPUT

DIGITAL OUTPUT 4.2. — *It includes the parameters enabling digital outputs inversion.*

INVERT O1 4.2.1 NO — *Enables or not the O1 digital inputs inversion.*
Setup range NO, YES.

INVERT O2 4.2.2 NO — *Enables or not the O2 digital inputs inversion.*
Setup range NO, YES.

INVERT O3 4.1.3 NO — *Enables or not the O3 digital inputs inversion.*
Setup range NO, YES.

INVERT O4 4.2.4 NO — *Enables or not the O4 digital inputs inversion.*
Setup range NO, YES.

INVERT O5 4.2.5 NO — *Enables or not the O5 digital inputs inversion.*
Setup range NO, YES.

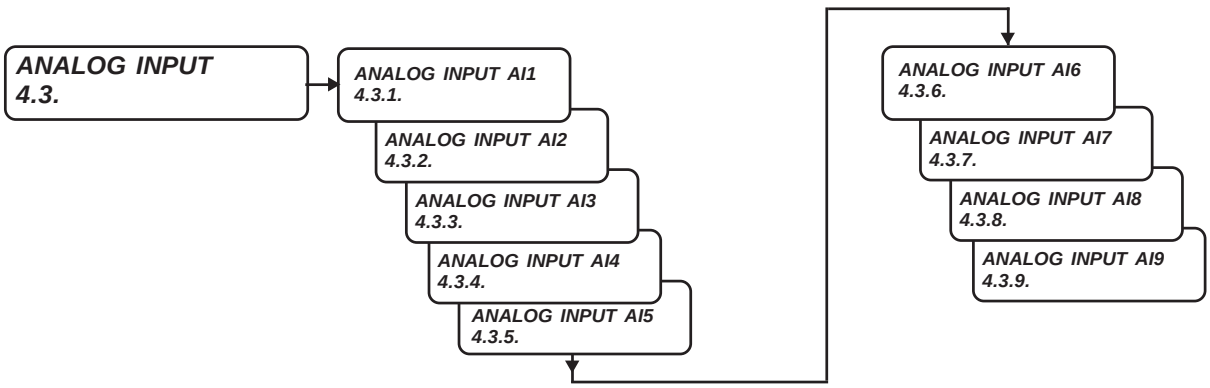
INVERT O6 4.2.6 NO — *Enables or not the O6 digital inputs inversion.*
Setup range NO, YES.

INVERT O7 4.2.7 NO — *Enables or not the O7 digital inputs inversion.*
Setup range NO, YES.

INVERT O8 4.2.8 NO — *Enables or not the O8 digital inputs inversion.*
Setup range NO, YES.

Groups and menu description 4.3. ANALOG INPUT

Menu 4. 3 ANALOG INPUT includes the parameter menus adapting analog inputs signal.



Menu parameters description 4.3.1. ANALOG INPUT AI1

ANALOG INPUT AI1
4.3.1.

It includes those parameters adapting AI1 analog input signal.

SCALE
.1 100.00%

Par. 4.3.1.1. Adaptes AI1 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.2 0.00%

Par. 4.3.1.2. Clears the AI1 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 -10V/+10V

Par. 4.3.1.3. Selects the signal type connected to AI1 analog input.

Setup range: 0/+10V, -10V/+10V.

Menu parameters description 4.3.2. ANALOG INPUT AI2

ANALOG INPUT AI2
4.3.2.

It includes those parameters adapting AI2 analog input signal.

SCALE
.1 100.00%

Par. 4.3.2.1. Adaptes AI2 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.2 0.00%

Par. 4.3.2.2. Clears the AI2 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 4/20mA

Par. 4.3.2.3. Selects the signal type connected to AI2 analog input.

Setup range: 0/+10V, -10V/+10V, 0/20mA, 4/20mA.

Menu parameters description 4.3.3. ANALOG INPUT AI3

ANALOG INPUT AI3
4.3.3.

It includes those parameters adapting AI3 analog input signal.

SCALE
.1 100.00%

Par. 4.3.3.1. Adaptes AI3 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.2 0.00%

Par. 4.3.3.2. Clears the AI3 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.3.3. Selects the signal type connected to AI4 analog input.

Setup range: 0/+10V, -10V/+10V.

Menu parameters description 4.3.4. ANALOG INPUT AI4

ANALOG INPUT AI4
4.3.4.

It includes those parameters adapting AI4 analog input signal.

SCALE
.1 100.00%

Par. 4.3.4.1. Adaptes AI4 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.2 0.00%

Par. 4.3.4.2. Clears the AI4 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.4.3. Selects the signal type connected to AI4 analog input.

Setup range: 0/+10V, -10V/+10V.

Menu parameters description 4.3.5. ANALOG INPUT AI5

ANALOG INPUT AI5
4.3.5.

It includes those parameters adapting AI5 analog input signal.

SCALE
.1 100.00%

Par. 4.3.5.1. Adaptes AI5 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.2 0.00%

Par. 4.3.5.2. Clears the AI5 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.5.3. Selects the signal type connected to AI5 analog input.

Setup range: 0/+10V, -10V/+10V.

Menu parameters description 4.3.6. ANALOG INPUT AI6

ANALOG INPUT AI6
4.3.6.

It includes those parameters adapting AI6 analog input signal.

SCALE
.1 100.00%

Par. 4.3.6.1. Adaptes AI6 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale.

OFFSET
.2 0.00%

Par. 4.3.6.2. Clears the AI6 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.6.3. Selects the signal type connected to AI6 analog input.

Setup range: 0/+10V.

Menu parameters description 4.3.7. ANALOG INPUT AI7

ANALOG INPUT AI7
4.3.7.

It includes those parameters adapting AI7 analog input signal.

SCALE
.1 100.00%

Par. 4.3.7.1. Adaptes AI7 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale.

OFFSET
.2 0.00%

Par. 4.3.7.2. Clears the AI7 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.7.3. Selects the signal type connected to AI7 analog input.

Setup range: 0/+10V.

Menu parameters description 4.3.8. ANALOG INPUT AI8

ANALOG INPUT AI8
4.3.8.

It includes those parameters adapting AI8 analog input signal..

SCALE
.1 100.00%

Par. 4.3.8.1. Adaptes AI8 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale.

OFFSET
.2 0.00%

Par. 4.3.8.2. Clears the AI8 analog input offset.

Setup range: from -50.00% to +50.00%.

TYPE INPUT
.3 0/+10V

Par. 4.3.8.3. Selects the signal type connected to AI8 analog input.

Setup range: 0/+10V.

Menu parameters description 4.3.9. ANALOG INPUT AI9

ANALOG INPUT AI9
4.3.9.

It includes those parameters adapting AI9 analog input signal..

SCALE
.1 100.00%

Par. 4.3.9.1. Adaptes AI9 analog input full-scale.

Setup range: from -300.00% to +300.00%.
100% value doesn't alter the scale.

OFFSET
.2 0.00%

Par. 4.3.9.2. Clears the AI9 analog input offset.

Setup range: from -50.00% to +50.00%.

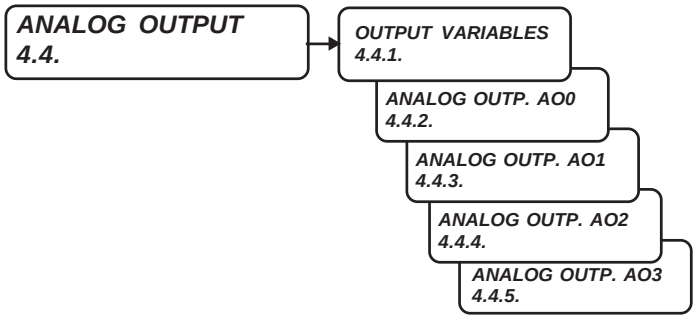
TYPE INPUT
.3 0/+10V

Par. 4.3.9.3. Selects the signal type connected to AI9 analog input.

Setup range: 0/+10V.

Groups and menu description 4.4. ANALOG OUTPUT

Menu 4.4. ANALOG OUTPUT includes the parameter menus adapting analog outputs signal and programming their function.



Menu parameters description 4.4.1. OUTPUT VARIABLES

OUTPUT VARIABLES
4.4.1.

It includes variables whose function is linked to an analog output.
Variables are in % and the ratio to the analog output is:
+100.00%= +10Vdc analog output, -100.00%= -10Vdc analog output
+/-100% value correspond to the analog output saturation limits too.

MOTOR CURRENT %
.1 100.00%

Variable N.1. Motor absorbed current in % to the nominal current in par.1.1.1 MOTOR NOM CURREN.

Display range: from -100.00% to +100.00%. Post time 5ms.

SET SPEED F %
.2 100.00%

Variable N.2. Reference to the speed set in % to the max. speed in par.1.3.1 MAX MOTOR SPEED. Fast signal (FAST variable).

Display range: from -100.00% to +100.00%. Post time 1ms.

MOTOR SPEED %
.3 100.00%

Variable N.3. Motor speed in % to the max speed in par.1.3.1 MAX MOTOR SPEED. Filtered signal.

Display range: from -100.00% to +100.00%. Post time 5ms.

MOTOR SPEED F %
.4 100.00%

Variable N.4. Motor speed in % to the max speed in par.1.3.1 MAX MOTOR SPEED. Fast signal (FAST variable).

Display range: from -100.00% to +100.00%. Post time 1ms.

MOTOR TORQUE %
.5 100.00%

Variable N.5. Motor torque in % to the nominal torque. Filtered signal.

Display range: from -300.00% to +300.00%. Post time 2 sec.

Real torques over +/-300.00% get saturated at +/-300.00%. For +/-10Vdc analog output to be equivalent to +/-300.00% torque, you must set 33.33% in SCALE parameters.

MOTOR TORQUE F %
.6 100.00%

Variable N.6. Motor torque in % to the nominal torque. Fast signal (FAST variable).

Display range: from -300.00% to +300.00%. Post time 1ms.

Real torques over +/-300.00% get saturated at +/-300.00%. For +/-10Vdc analog output to be equivalent to +/-300.00% torque, you must set 33.33% in SCALE parameters.

REMOTE SET1 %
.7 100.00%

Variable N.7. % value to be setup in serial mode. See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.

Display range: from -100.00% to +100.00%. Post time 5ms.

REMOTE SET2 %
.8 100.00%

Variable N.8. % value to be setup in serial mode. See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.

Display range: from -100.00% to +100.00%. Post time 5ms.

REMOTE SET3 %
.9 100.00%

Variable N.9. % value to be setup in serial mode. See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.

Display range: from -100.00% to +100.00%. Post time 5ms.

REMOTE SET4 %
.10 100.00%

Variable N.10. % value to be setup in serial mode. See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.

Display range: from -100.00% to +100.00%. Post time 5ms.

STRETCH %	
.11	100.00%

Variable N.11. Active STRECH on the material during the winding / unwinding. (visible only in the inverter C400W series with WINDER application)

Display range: from 0.00% to +100.00%. 100.00% corresponds to the set value in par. 3.6.6.3/3.6.7.3 STRETCH MAX SET

DIAMETER %	
.12	100.00%

Variable N.12. Actual coil DIAMETER during the winding / unwinding. (visible only in the inverter C400W series with WINDER application)

Display range from 0.00% to +100.00%. 100.00% corresponds to the set value in par. 3.6.3.14.2 MAX DIAMETER

COIL LINE SPEED %	
.13	100.00%

Variable N.13. Actual coil PERIPHERAL SPEED during the winding / unwinding. (visible only in the inverter C400W series with WINDER application)

Diplay range: from 0.00% to +100.00%. 100.00% corresponds to the set value in par. 3.6.3.8 LINE SPEED MAX.

Menu parameters description 4.4.2. ANALOG OUTP. AO0

ANALOG OUTP. AO0
4.4.2.

It includes those parameters adapting the AO0 analog output signal and determining its function.

VAR DISPLAY	
.1	1.

Par. 4.4.2.1. Set in this parameter the menu 4.4.1 OUTPUT VARIABLES variable nr, whose function is required to be associated with AO0 analog output.

Setup range: from 1. to 10.

Caution !

AO0 analog output sampling time is shorter than all other outputs, so this is the one which could follow in the best way FAST variables variations.

SCALE	
.2	100.00%

Par. 4.4.2.2. Adaptes AO0 analog output full-scale.

Setup range: from -300.00% to +300.00%.

100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET	
.3	100.00%

Par. 4.4.2.3. Clears AO0 analog output offset.

Setup range: from -10.00% to +10.00%.

TYPE OUTPUT	
.4	ABS

Par. 4.4.2.4. Selects the signal type connected to AO0 analog output.

Setup range: DIRECT, ABS.

DIRECT= the analog output follows directly the associated variable value and sign.

ABS= the analog output can only be set at positive values and follows only the associated variable absolute value.

Menu parameters description 4.4.3. ANALOG OUTP. AO1

ANALOG OUTP. AO1
4.4.3.

It includes those parameters adapting the AO1 analog output signal and determining its function.

VAR DISPLAY	
.1	2.

Par. 4.4.3.1. Set in this parameter the menu 4.4.1 OUTPUT VARIABLES variable nr, whose function is required to be associated with AO1 analog output.

Setup range: from 1. to 10.

SCALE	
.2	100.00%

Par. 4.4.3.2. Adaptes AO1 analog output full-scale.

Setup range: from -300.00% to +300.00%. 100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET	
.3	100.00%

Par. 4.4.3.3. Clears AO1 analog output offset.

Setup range: from -10.00% to +10.00%.

TYPE OUTPUT	
.4	DIRECT

Par. 4.4.3.4. Selects the signal type connected to AO1 analog output.

Setup range: DIRECT, ABS.

DIRECT= the analog output follows directly the associated variable value and sign.

ABS= the analog output can only be set at positive values and follows only the associated variable absolute value.

Menu parameters description 4.4.4. ANALOG OUTP. AO2

ANALOG OUTP. AO2
4.4.4.

It includes those parameters adapting the AO2 analog output signal and determining its function.

VAR DISPLAY
.1 3.

Par. 4.4.4.1. Set in this parameter the menu 4.4.1 OUTPUT VARIABLES variable nr, whose function is required to be associated with AO2 analog output.

Setup range: from 1. to 10.

SCALE
.2 100.00%

Par. 4.4.4.2. Adaptes AO2 analog output full-scale.

Setup range: from -300.00% to +300.00%.

100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.3 100.00%

Par. 4.4.4.3. Clears AO2 analog output offset.

Setup range: from -10.00% to +10.00%.

TYPE OUTPUT
.4 DIRECT

Par. 4.4.4.4. Selects the signal type connected to AO2 analog output.

Setup range: DIRECT, ABS.

DIRECT= the analog output follows directly the associated variable value and sign.

ABS= the analog output can only be set at positive values and follows only the associated variable absolute value.

Menu parameters description 4.4.5. ANALOG OUTP. AO3

ANALOG OUTP. AO3
4.4.5.

It includes those parameters adapting the AO3 analog output signal and determining its function.

VAR DISPLAY
.1 5.

Par. 4.4.5.1. Set in this parameter the menu 4.4.1 OUTPUT VARIABLES variable nr, whose function is required to be associated with AO3 analog output.

Setup range: from 1. to 10.

SCALE
.2 100.00%

Par. 4.4.5.2. Adaptes AO3 analog output full-scale.

Setup range: from -300.00% to +300.00%.

100% value doesn't alter the scale. -100% value doesn't alter the scale and changes the sign.

OFFSET
.3 100.00%

Par. 4.4.5.3. Clears AO3 analog output offset.

Setup range: from -10.00% to +10.00%.

TYPE OUTPUT
.4 DIRECT

Par. 4.4.5.4. Selects the signal type connected to AO3 analog output.

Setup range: DIRECT, ABS.

DIRECT= the analog output follows directly the associated variable value and sign.

ABS= the analog output can only be set at positive values and follows only the associated variable absolute value.

• Analog outputs response times and variables assignation example

- AO0 analog output associated to FAST variables has a 2,6ms max. post time, while if associated to other variables, its max. post time is 6,6ms.

- AO1 analog output associated to all variables has always a ,6ms max. post time.

- AO2, AO3 analog output associated with all variables have a 20ms max. post time.

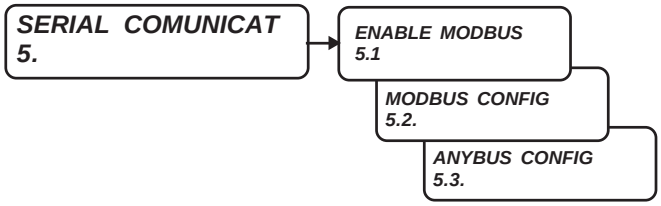
ASSIGNATION EXAMPLE

If you want to associate var. 4.4.1.4 MOTOR SPEED F% with AO0 analog output:

Set par. 4.4.2.1 VAR DISPLAY=4.

Groups and menu description 5. SERIAL COMUNICAT

Menu 5. SERIAL COMUNICAT includes those parameters menus setting the serial communication for the different field busses.See enclosure: Instruction manual INVERTER SERIES 400 SERIAL TRANSMISSION, for a complete description of the serial communication



ENABLE MODBUS	
5.1	DISABLE

It enables and disables the standard serial transmission (MODBUS RTU or ROWAN)

Setup range: DISABLE, ENABLE.

DISABLE= It disables the standard field busses (not ANYBUS) and keeps in reset mode the related peripheral devices; it clears reception and transmission messages.

Caution ! → To enable variations on serial transmission setup parameters of menu 5.2 MODBUS CONFIG, it is necessary to select DISABLE and then ENABLE or to power off and then power the inverter up again.

ENABLE= It enables the standard serial transmission by MODBUS RTU or ROWAN protocols.

Menu parameters description 5.2 MODBUS CONFIG

MODBUS CONFIG	
5.2.	

It includes the parameters setting the basic standard RS485 serial communication by MODbus OR ROWAN protocols

PROTOCOL	
5.2.1	MODBUS

It enables the basic standard RS485 serial communication protocol.

Setup range: MODBUS, ROWAN.

MODBUS= enables the MODBUS RTU serial protocol; ROWAN= enables the ROWAN serial protocol.

ADDRESS	
5.2.2	2.

It sets the inverter serial address.

Setup range: from 1 to 247.

BAUD RATE	
5.2.3	9600.

It sets the bps transmission speed.

Setup range: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200.

PARITY	
5.2.4	NONE

It enables or disable the parity control of the single character or type.

Setup range: NONE, EVEN, ODD.

NONE= It disables the character parity control. **EVEN**= It enables the EVEN character parity control. **ODD**= It enables the ODD character parity control.

BIT STOP	
5.2.5	1.

It sets the stop bit nr for each character.

Setup range: from 1 to 2.

RESET ERR. COUNT	
5.2.6	NO

It enables to clear the communication errors displayed in variables: var.2.1.43 LAST TWO ERR COM, var. 2.1.44 COUNT ERROR COM.

Setup range: NO, YES.

To clear up, select **YES** and after 2s the selection goes back to **NO** automatically.

INACTIVITY TIME	
5.2.7	30.00s

It enables/disables the serial line activity timed control.

Setup range: from 0.00s to 30.00s.

If 0.00s or 30.00s is set, the control is excluded. If a value between 0.01s and 29.9s is set, the control is enabled. If from the last message some time passes without another message is got, the inverter blocks for **fault 40. LOST COMMUNICATION**. At the inverter power supplying, the timed control is kept disabled and will be enabled only after the reception of the first valid message.

Menu parameters description 5.3 ANYBUS CONFIG

ANYBUS CONFIG
5.3.

It contains parameters useful for the serial communication functioning through the ANYBUS module installed in the optional expansion card.
Field bus now available : CANOPEN, PROFIBUS,MODBUS TCP/IP, ETHERCAT, PROFINET.

ADDRESS
5.3.1 **0.**

Set the CANOPEN, PROFIBUS or MODBUS TCP/IP serial address, depending on the ANYBUS kind of module.

Setting field from 0 to 250.
The 0 setting switches off completely the functioning of the ANYBUS module.

CYCLIC CONFIG
5.3.2

It contains parameter for configuration of the cyclic trasmission (max priority data trasmission), used by protocols:
CANOPEN, PROFIBUS, MODBUS TCP/IP, ETHERCAT, PROFINET

PZD1 READ
5.3.2.1 **0.**

Cyclic Data address to read PZD1

Setup range from 0 to 250.

PZD2 READ
5.3.2.2 **0.**

Cyclic Data address to read PZD2

Setup range from 0 to 250.

PZD3 READ
5.3.2.3 **0.**

Cyclic Data address to read PZD3

Setup range from 0 to 250.

PZD4 READ
5.3.2.4 **0.**

Cyclic Data address to read PZD4

Setup range from 0 to 250.

PZD5 READ
5.3.2.5 **0.**

Cyclic Data address to read PZD5

Setup range from 0 to 250.

PZD6 READ
5.3.2.6 **0.**

Cyclic Data address to read PZD6

Setup range from 0 to 250.

PZD7 READ
5.3.2.7 **0.**

Cyclic Data address to read PZD7

Setup range from 0 to 250.

PZD8 READ
5.3.2.8 **0.**

Cyclic Data address to read PZD8

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.9 **0.**

Cyclic Data address to write PZD1

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.10 **0.**

Cyclic Data address to write PZD2

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.11 **0.**

Cyclic Data address to write PZD3

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.12 **0.**

Cyclic Data address to write PZD4

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.13 **0.**

Cyclic Data address to write PZD5

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.14 **0.**

Cyclic Data address to write PZD6

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.15 **0.**

Cyclic Data address to write PZD7

Setup range from 0 to 250.

PZD1 WRITE
5.3.2.16 **0.**

Cyclic Data address to write PZD8

Setup range from 0 to 250.

ETHERNET CONFIG 5.3.3

It contains parameter for configuration of the ANYBUS module in ETHERNET serial communication

DHCP Option 5.3.3.1 0.

Enable / Disable the use of DHCP server, for automatic address IP acquisition.

Setup range: NO, YES.

IP Field 1 5.3.3.2 192.

Network parameter: IP ADDRESS, 1° Field Setup

Setup range from 0 to 255.

IP Field 2 5.3.3.3 168.

Network parameter: IP ADDRESS, 2° Field Setup

Setup range from 0 to 255.

IP Field 3 5.3.3.4 1.

Network parameter: IP ADDRESS, 3° Field Setup

Setup range from 0 to 255.

IP Field 4 5.3.3.5 100.

Network parameter: IP ADDRESS, 4° Field Setup

Setup range from 0 to 255.

NETMASK Field 1 5.3.3.6 255.

Network parameter: NETMASK, 1° Field Setup

Setup range from 0 to 255.

NETMASK Field 2 5.3.3.7 255.

Network parameter: NETMASK, 2° Field Setup

Setup range from 0 to 255.

NETMASK Field 3 5.3.3.8 255.

Network parameter: NETMASK, 3° Field Setup

Setup range from 0 to 255.

NETMASK Field 4 5.3.3.9 0.

Network parameter: NETMASK, 4° Field Setup

Setup range from 0 to 255.

GATEWAY Field 1 5.3.3.10 192.

Network parameter: GATEWAY, 1° Field Setup

Setup range from 0 to 255.

GATEWAY Field 2 5.3.3.11 168.

Network parameter: GATEWAY, 2° Field Setup

Setup range from 0 to 255.

GATEWAY Field 3 5.3.3.12 1.

Network parameter: GATEWAY, 3° Field Setup

Setup range from 0 to 255.

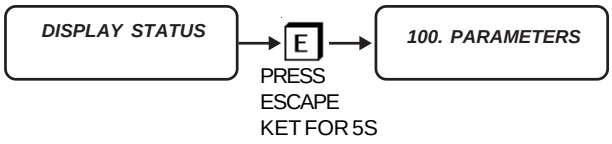
GATEWAY Field 4 5.3.3.13 1.

Network parameter: GATEWAY, 4° Field Setup

Setup range from 0 to 255.

To obtain more detailed information about field bus functioning, please see the specific serial transmission manual code MANU.400TS.

Menu 100. parameters description



Caution !

In menu 100. some parameters concerning the inverter basic functions are included, such as:
Motor control type, applications, keyboard setup, parameters copy and transfer. For this reason they must be set carefully.

To enter the 100. parameters programming, the display must be in variables DISPLAY STATUS. By pressing ESCAPE key for 5s, you enter the first parameter programming.

MOT CONTROL TYPE
100.1 V/F

It enables the motor control type

Setup range: V/F, VECT_ENC.

V/F= V/F SCALAR.

VECT_ENC= VECTORIAL, WITH ENCODER FEEDBACKED FIELD ORIENTATION.

The setup modification is enabled only at RUN command OFF. The new function will be received at RUN command ON.

RESET LAST FAULT
100.2 NO

It clears the last inverter fault displayed in var.2.1.16 LAST FAULT.

Setup range: NO, YES.

To clear up, select **YES** and after 2s the selection goes back to NO automatically.

MENU OPERATOR
100.3 DEFAULT

Remote keyboard parameters setup access modality after P Key (Program) is pushed

Setup range: DEFAULT, BLOCK, OPERATOR, OP_BLOCK.
DEFAULT = Free access to BASIC DATA menu with default parameters and to following menu (1. 2. 3. 4. 5.)
BLOCK = Denied access to all parameters.
OPERATOR = Free access to BASIC DATA menu with OPERATOR type parameters and to following menu (1. 2. 3. 4. 5.)
OP_BLOCK = Free access to BASIC DATA menu only, with OPERATOR type parameters.

See paragraph **BASIC DATA menu in OPERATOR mode description**.

PAR.99 BLOCK
100.4 NO

It enables or not the access to 99. standard parameters, both in manual and in serial mode.

Setup range: NO, YES.

APPLICATION 100.5 SPEED

Application selection.

Setup range: SPEED, AXIS, REGUL, GEN_AFE, COSTUM1, WINDER.

SPEED= basic application: MOTOR SPEED CONTROL. It enables all 3.1 SPEED menù setups.

AXIS= application: AXIS CONTROL (ELECTRIC AXIS, POSITIONER).

It enables all 3.2 AXIS menù setups, only if firmware is XXX.01

REGUL.= application: REGULATOR WITH DIFFERENT FUNCTION

It enables all 3.3 REGULATOR menù setups, only if firmware is XXX.02
GEN_AFE.= application: SINUSOIDAL GENERATOR. It enables all 3.4 GEN_AFE menù setups, only if firmware is XXX.03
CUSTOM1 = application: CUSTOM. It enables all 3.5 CUSTOM1 menu setups, only if firmware is XXX.04.
WINDER = Application: WINDING/UNWINDING SYSTEMS.
Enables all 3.6 WINDER menu setups, but on firmware versions XXX05.XX only.

The setup modification is enabled only at RUN command OFF. The new function will be received at RUN command ON.

SET UP 100.6

It enables to manage inverter parameters copies and their bidirectional transfer by USB key. All menu 100.6 setups modification are possible only at RUN OFF.

RESTORE SETUP 100.6.1 DEFAULT

It selects the memory area to be restored on the WORKING MEMORY, through the manual command of par.100.6.2 ENABLE RESTORE.

Setup range: DEFAULT, SETUP_1, SETUP_2.
The inverter eeprom buffer is divided into the following 4 areas, each including copy of all inverter parameters.
WORKING MEMORY = all parameters which can be modified by the keyboard are saved in this eeprom buffer area and shown at each inverter starting.
DEFAULT MEMORY = it includes copy of all inverter standard parameters, which cannot be modified by the operator.
If no parameter is modified, the WORKING MEMORY is the same as DEFAULT MEMORY.
SETUP_1 MEMORY = customizes copy of all parameters available to the operator.
SETUP_2 MEMORY= customizes copy of all parameters available to the operator.

ENABLE RESTORE 100.6.2 NO

It contains the manual command to restore, on the WORKING MEMORY, all parameters from the memory area selected by par.100.6.1 RESTORE SETUP.

Setup range: NO, YES.

Select **YES** and confirm by P key to enable restoring. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

SAVE SETUP 100.6.3 SETUP_1

It selects the kind of SETUP memory where all parameters of the WORKING MEMORY will be saved through the manual command by par.100.6.4 ENABLE SAVE.

Setup range: SETUP_1, SETUP_2.

ENABLE SAVE 100.6.4 NO

It contains the command saving all parameters of the WORKING MEMORY on the SETUP memory selected by par.100.6.3 SAVE SETUP.

Setup range: NO, YES.

Select **YES** and confirm by P key to enable saving. **YES** will be displayed for all copy operation, then the selection will go back to **NO** automatically. Post time: about 20s.

IN START RESTORE 100.6.5 REMOTE

It assignes the command for restoring, in the WORKING MEMORY , all parameters of the SETUP memory area. This SETUP memory area is selected by the command assigned in par. 100.6.6 IN RESTORE SETUP.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.
REMOTE= Command **OFF** and no digital input assigned.
I2...I14= Assignation of the command to the selected digital input.
ENABLE= Command always **ON**.
Select ON for at least 10ms to start restoring (pulse command).

IN RESTORE SETUP 100.6.6 REMOTE

It assignes the command to select SETUP_1 MEMORY or SETUP_2 MEMORY to be restored in WORKING MEMORY by the command assigned in par.100.6.5 IN START RESTORE.

Setup range: REMOTE, I2, I3, I4, I5, I6, I7, I8, I9, I10, I11, I12, I13, I14, ENABLE.

REMOTE= Command **OFF** and no digital input assigned.

I2...I14= Assignation of the command to the selected digital input.

ENABLE= Command always **ON**.

Command OFF= SETUP1 MEMORY selected. Command ON= SETUP2 MEMORY selected.

When starting, RESTORE SETUP is disabled for 3.5s

TYPE RESTORE	
100.6.7	FULL

It choses the restore type in JOB BUFFER.

Setup range: FULL, QUICK.

FULL= COMPLETE restore of all parameters in the selected memory area (SETUP1 or SETUP2). Post time: about 20s.

QUICK= Partial restore of the parameters in the selected memory area (SETUP1 or SETUP2).

Post time: about 0,3s. The restore is limited to the following parameters:

100.1 MOT CONTROL TYPE, 1.1.2 MOTOR NOM CURREN, 1.1.3 MOTOR NOM FREQUE, 1.1.4 MOTOR NOM VOLTAG, 1.1.5 MOTOR POLES, 1.2.1 RAMO ACCEL. TIME, 1.2.2 RAMP DECEL. TIME, 1.3.1 MAX MOTOR SPEED, 1.3.2 MIN MOTOR SPEED, 1.5.1 FIXED BOOST, 1.6.1 E1 ENCODER LINES, 1.6.4 VECT MAGNET CURR, 1.6.5 ROTOR CONSTANT, 3.1.10.1 MOTOR ENABLE OUT, 1.6.2 KP GAIN, 1.6.3 KI GAIN, 1.10.1 MAX TORQUE, 1.10.15 ADAPT PERC TORQ., 1.10.16 ADAPT TORQ. Nm, 1.12.1PWM FREQUENCY.

Caution ! → It is not possible to activate the inverter RUN command during restoring or saving operations.

COPY KEY >> INV	
100.6.8	0.

It enables restoring in the inverter internal memory of all parameters copies from the external EEPROM KEY, by USB CONNECTOR.

Setup range: 0. , 100.

EEPROM KEY has a eeprom memory which is equivalent to that of the inverter with the same division into areas such as:

WORKING MEMORY, DEFAULT MEMORY, SETUP_1 MEMORY, SETUP_2 MEMORY.

Select **NUMBER 37** and confirm by P key to enable restoring. **NUMBER 37** will be displayed for all restore operation, then the selection will go back to **ZERO** automatically. Post time: about 70s.

Caution !

During the restoring operation, the keyboard is blocked and it is not possible to enable the inverter RUN command. If restoring procedure is performed with no EEPROM KEY inserted, the internal memory won't be modified, but the keyboard remains blocked; in this case it is necessary to power the inverter off and then to start it again in order to unblock it.

COPY INV >> KEY	
100.6.9	0.

It enables saving in the external EEPROM KEY of all parameters copies from the inverter internal memory, by USB CONNECTOR.

Setup range: 0. , 100.

Select **NUMBER71** and confirm by P key to enable restoring. **NUMBER71** will be displayed for all restore operation, then the selection will go back to **ZERO** automatically. Post time: about 70s

Caution !

During the saving operation, the keyboard is blocked and it is not possible to enable the inverter RUN command. If saving procedure is performed with no EEPROM KEY inserted, the keyboard remains blocked; in this case it is necessary to power the inverter off and then to start it again in order to unblock it.

Caution!

See Chapter 11 PARAMETERS TRANSFER for a complete description of parameters copies management by EEPROM KEY and USB CONNECTOR.

ALARM SETUP
100.7

Menu to enable/disable the alert at I/O resources assignation.

ALARM PROG IN	
100.7.1	YES

It enables or not the alarm in case of multiple assignations to a digital input.

Setup range: NO, YES.

NO= it disables the alarm if a multiple assignations to a digital input is necessary.

YES= alarm enabled; when the same digital input is assigned in 2 or more parameters, the fault light starts flashing and in **var. 2.1.50 INVERTER ALARM** the **PROG_IN** string is displayed. In this case it is necessary to check where this parameter has already been assigned; to make this easier, see the table in Chapter 13 where all digital inputs assignation parameters and their default setups are summed up.

ALARM PROG OUT	
100.7.2	YES

It enables or not the alarm in case of multiple assignations to a digital output.

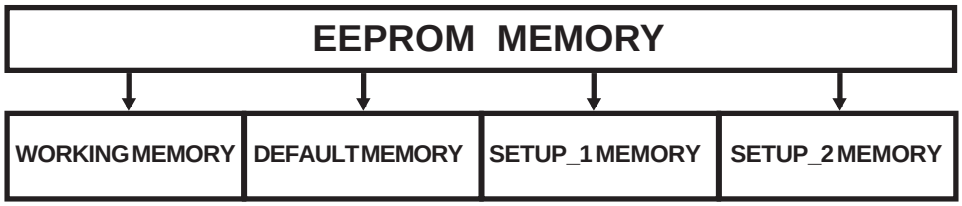
Setup range: NO, YES.

NO= it disables the alarm if a multiple assignations to a digital output is necessary.

YES= alarm enabled; when the same digital output is assigned in 2 or more parameters, the fault light starts flashing and in **var. 2.1.50 INVERTER ALARM** the **PROG_OUT** string is displayed. In this case it is necessary to check where this parameter has already been assigned; to make this easier, see the table in Chapter 13 where all digital outputs assignation parameters and their default setups are summed up.

Stucture of the internal EEPROM MEMORY of parameters

The inverter eeprom memory is divided into 4 areas, each including copy of all the inverter parameters, the standard ones included, as shown in the diagram below:



WORKING MEMORY	*It includes those parameters which can be modified by the keyboard and shown at each inverter starting.*
DEFAULT MEMORY	*It includes the parameters with standard setups, which cannot be modified by the operator.*
SETUP_1 MEMORY	*First file with customized setup.*
SETUP_2 MEMORY	*Second file with customized setup*

Caution !
All inverters are manufactured with the same copies as those in DEFAULT MEMORY.

Possible operations by parameters memories

Caution ! → It is not possible to activate the inverter RUN during restoring or saving operations.

- ***Restoring, by the keyboard, of DEFAULT memory into WORKING memory (it restores the inverter orignal standard setups).***

PROCEDURE:
Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= DEFAULT**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Saving, by the keyboard, of WORKING memory into SETUP_1 memory.***
  It enables to save customized setups in SETUP_1 file.

PROCEDURE:
Enter 100. parameters. Set **par.100.6.3 SAVE SETUP= SETUP_1**. To enable saving, enter **par.100.6.4 ENABLE SAVE**, select **YES** and confirm by E key. **YES** will be displayed for all saving operation (about 20s), then the selection will go back to **NO** automatically.

- ***Saving, by the keyboard, of WORKING memory into SETUP_2 memory. It enables to save customized setups in SETUP_2 file.***

PROCEDURE:
Enter 100. parameters. Set **par.100.6.3 SAVE SETUP= SETUP_2**. To enable saving, enter **par.100.6.4 ENABLE SAVE**, select **YES** and confirm by E key. **YES** will be displayed for all saving operation (about 20s), then the selection will go back to **NO** automatically.

- **Restoring of SETUP_1 and SETUP_2 memory into WORKING memory;** this is possible by the keyboard or by an external command in 2 modes which can be set by **par.100.6.7 TYPE RESTORE:**

  FULL= COMPLETE restore of all parameters. Execution time: about 20s.

  QUICK= Partial restore of the parameters (see **par.100.6.7** description). Execution time: about 0,3s.

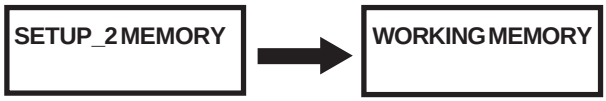
  The restore operations of SETUP_1 and SETUP_2 memory into WORKING memory are:

- **Restoring, by the keyboard, of SETUP_1 memory into WORKING memory**

PROCEDURE:

Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= SETUP 1**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Restoring, by the keyboard, of SETUP_2 memory into WORKING memory.***



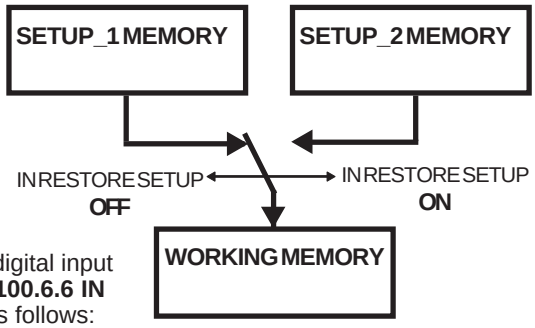
PROCEDURE:

Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= SETUP 2**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Restoring, by a digital input command, of SETUP_1 and SETUP_2 memory into WORKING memory.***

The selection of the buffer to be restored is performed by another digital input to be programmed.

This function may be used, e.i. when the same drive is used for vectorial control of two different motors or to enter different applications (SPEED or AXIS CONTROL) by an external PLC logics.



PROCEDURE:

Enter 100. parameters. Program in **par.100.6.5 IN START RESTORE** the digital input **commanding** the start at restoring of the selected buffer. Program in **par.100.6.6 IN RESTORE SETUP** the digital input **selecting** the memory to be restored as follows: When this input if OFF, SETUP_1 memory will be restored; by input ON, SETUP_2 memory will be restored. To start restore, enable the input programmed in **par.100.6.5 IN START RESTORE** for at least 10ms (pulse).

Caution !

Caution! Var.2.1.41 LAST RESTORE displays the last type of parameters MEMORY, restored in WORKING MEMORY (DEFAULT, SETUP_1, SETUP_2).

Parameters transfer by EEPROM KEY and USB CONNECTOR

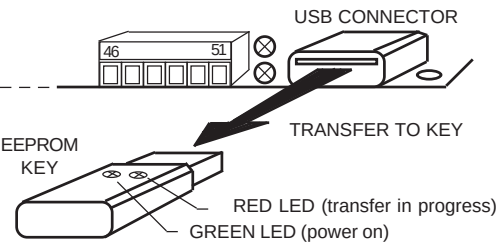
The EEPROM KEY includes an eeprom memory which is equivalent to that of the inverter with the same areas divisions into:

WORKING MEMORY, DEFAULT MEMORY, SETUP_1 MEMORY, SETUP_2 MEMORY.
By the EEPROM KEY and the USB CONNECTOR it is possible to save the inverter eeprom memory into the key, or, viceversa, to restore the key eeprom memory into that of the inverter; saving/restoring is possible only with the whole memory and not with single areas. The possible operations are the following:

- **Saving of the inverter memory into that of the EEPROM KEY. Procedure**:

insert the key into the USB CONNECTOR; if the **green led** lights up, the key is supplied properly. Enter 100. parameters by pressing ESCAPE key for 5 s; to start saving, enter **par.100.6.9 Copy INV >> KEY**, enter **71**

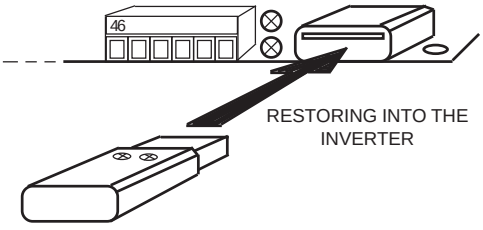
When the **red led** on the key lights up, transfer is in progress; at the saving end, the red led extinguishes and the selection in **par.100.6.9** goes back to **0.**



- **Restoring of the EEPROM KEY memory into the inverter memory. Procedure**:

insert the key into the USB CONNECTOR; if the **green led** lights up, the key is supplied properly. Enter 100. parameters by pressing ESCAPE key for 5 s; to start saving, enter **par.100.6.8 Copy KEY >> INV**, enter **37**.

When the **red led** on the key lights up, transfer is in progress; at the saving end, the red led extinguishes and the selection in **par.100.6.8** goes back to **0.**



Caution !

During the saving/restoring operations (about 70s), the keyboard is blocked and it is not possible to enable the inverter RUN. If the procedures are performed with no EEPROM KEY inserted, no change takes place, but the keyboard remains blocked; in this case it is necessary to power the inverter off and then to start it again in order to unblock it.

At present, USB commercial keys, used for PCs as memory of an external mass, cannot be used for parameters transfer (this will be possible in the future). In the same way, ROWAN EL. EEPROM KEY cannot be used as mass memory for PCs.

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
1. MOTOR CONTROL								
1.1 INV / MOTOR DATA								
1.1.1 LINE VOLTAGE	150 - 600	V	400	rw	1087	-	-	-
1.1.2 MOTOR NOM CURREN	0.1 - par.99.15	A	*1)	rw	1000	-	-	-
1.1.3 MOTOR NOM FREQUE	1.0 - 800.0	Hz	50.0	rw	1001	-	-	-
1.1.4 MOTOR NOM VOLTAG	1 - 2000	V	400	rw	1002	-	-	-
1.1.5 MOTOR POLES	2 POLI, 4 POLI 6 POLI 8 POLI	-	4 POLES	rw	1003	-	-	-
1.1.6 NAMEPLATE SLIP	0 - 1000 rpm	rpm	*1)	rw	1004	-	-	-
1.1.7 NAMEPLATE KWatt	0.00 - 10000.00	Kw	*1)	rw	1005/1006	-	-	-
1.1.8 NAMEPLATE COS(PHI)	0.000 - 1.000	-	*1)	rw	1007	-	-	-
1.1.9 MOTOR PTC AI4	0.00 - 10.00	V	10.00	rw	4000	-	-	-
1.1.10 MOTOR LOAD FUNC	NO, YES	-	NO	rw	1044	-	-	-
1.2 SPEED RAMP								
1.2.1 RAMP ACCEL. TIME	0.01 - 600.00	s	10.00	rw	1008/1009	2038 (long)	68/69	4316 (long)
1.2.2 RAMP DECEL. TIME	0.01 - 600.00	s	10.00	rw	1010/1011	2039 (long)	70/71	4320 (long)
1.2.3 ENABLE S RAMP	NO, YES	-	NO	rw	1036	-	-	-
1.2.4 ROUNDING FILTER	0.01 - 300.00	s	0.5	rw	1037	-	-	-
1.2.5 FUNC. CHANGE RAMP	NO, YES	-	NO	rw	1042	-	-	-
1.2.6 ACC. UNDER SPEED	0.01 - 600.00	s	30.00	rw	1038/1039	-	-	-
1.2.7 SPEED ACC LEVEL	0.01 - 600.00	s	800	rw	1043	-	-	-
1.2.8 DEC. UNDER SPEED	0.01 - 600.00	s	30.00	rw	1040/1041	-	-	-
1.2.9 SPEED DEC LEVEL	0 - par.1.3.1	rpm	800	rw	4001	-	-	-
1.3 SPEED LIMIT								
1.3.1 MAX MOTOR SPEED	0 - 30000	rpm	1500	rw	1012	-	-	-
1.3.2 MIN MOTOR SPEED	0 - par.1.3.1	rpm	0	rw	1013	-	-	-
1.4 TEST MANUAL								
1.4.1 TEST MANU SPEED	0 - par.1.3.1	rpm	300	rw	4002	-	-	-
1.4.2 JOG TEST MANU	NO, YES	-	NO	rw	4003	-	-	-
1.5 VOLTS/Hz CONTROL								
1.5.1 FIXED BOOST	0.0 - 25.0	%	*1)	rw	1014	-	-	-
1.5.2 MIN SPEED % SLIP	0 - 500	%	200	rw	1015	-	-	-
1.5.3 V/F TYPE	V/F_1, V/F_2, V/F_3	-	V/F_1	rw	1016	-	-	-
1.5.4 STOP BOOST FREQ.	10.0 - par 1.1.3	Hz	25.0	rw	1088	-	-	-
1.5.5 ACCELER BOOST	0.0 - 25.0	%	0.0	rw	1017	-	-	-
1.5.6 ENABLEFLYING VF	NO, YES	-	NO	rw	1022	-	-	-
1.5.7 SLIP COMP ENABLE	NO, YES	-	NO	rw	1023	-	-	-
1.5.8 NOLOAD I x COS(PHI)	0.1 - 3000.0		*1)	rw	1024	-	-	-
1.5.9 OVERLOAD FUNC.								
1.5.9.1 ENABLE OVERLOAD	DISABLE, ON/OFF, REG/PI	-	DISABLE	rw	4004	-	-	-
1.5.9.2 MAX OVERLOAD CUR	100 - 300	%	100.0	rw	1018	-	-	-
1.5.9.3 MIN OVERLOAD SPE	0 - par.1.3.1	rpm	*1)	rw	1019	-	-	-
1.5.9.4 DEC.RAMP.OVERLOAD	0.01 - 300.00	s	10.00	rw	4005	-	-	-
1.5.9.5 KP REG OVERLOAD	0.00 - 250.00	-	20.00	rw	4006	-	-	-
1.5.9.6 KI REG OVERLOAD	0.00 - 250.00	-	10.00	rw	4007	-	-	-
1.5.9.7 MIN SPEED TIME	0.0 - 1800.0	s	0.0	rw	4008	-	-	-
1.5.9.8 MIN SPEED UNLOCK	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4009	-	-	-
1.5.10 HIGH TORQUE FUNC								
1.5.10.1 PERC UP V/F	0.0 - 25.0	%	*1)	rw	1020	-	-	-
1.5.10.2 KP UP V/F	0 - 100	-	*1)	rw	1021	-	-	-
1.5.10.3 HT MAX TIME MSEC	0.000 - 30.000	s	10.00	rw	4010	-	-	-
1.5.10.4 HT OVERL. SPEED	0 - 30000	rpm	1300	rw	4011	-	-	-
1.5.10.5 SPEED DISABLE HT	NO, YES		YES	rw	4012	-	-	-
1.5.11 CURRENT LIMIT								
1.5.11.1 MOD I LIM RAMP	DISABLE, STOP_RAMP, PI_RAMP	-	StopRAMP	rw	4013	-	-	-
1.5.11.2 I max ACC RAMP	0.1 - par.99	A	*1)	rw	4014	-	-	-
1.5.11.3 PERC SLEEP DEC	0 - 300	%	50	rw	4015	-	-	-
1.5.11.4 MOD I LIM STEADY	DISABLE ,PI_REG	-	PI_REG	rw	4016	-	-	-
1.5.11.5 I max STEADY	0.1 - par.99	A	*1)	rw	4017	-	-	-
1.5.11.6 KP REG PI	0 - 1000	-	1000	rw	4018	-	-	-
1.5.11.7 KI REG PI	0 - 1000	-	1	rw	4019	-	-	-
1.5.11.8 KP Imax BOOST	0 - 1000	-	300	rw	4020	-	-	-
1.5.11.9 KI Imax BOOST	0 - 1000	-	50	rw	4021	-	-	-

***1) Depends on size**

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	IDMODBUS TCP/IP RAM (dec)
1.5.12 SPEED JUMP								
1.5.12.1 JUMP SET 1	0 - 24000	rpm	0	rw	4022	-	-	-
1.5.12.2 JUMP SET 2	0 - 24000	rpm	0	rw	4023	-	-	-
1.5.12.3 JUMP BAND	0 - 600	rpm	0	rw	4024	-	-	-
1.6 ENCODER VECTOR								
1.6.1 E1 ENCODER LINES	1 - 5000	-	1000	rw	1025	-	-	-
1.6.2 KP GAIN	0 - 100	-	*1)	rw	1026	-	-	-
1.6.3 KI GAIN	0 - 100	-	*1)	rw	1027	-	-	-
1.6.4 VECT MAGNET CURR	0 .0 - 100.0	%	*1)	rw	1028	-	-	-
1.6.5 ROTOR COSTANT	0 .0 - 100.0	Hz	*1)	rw	1029	-	-	-
1.6.6 E2 ENCODER LINES	1 - 5000	-	2000	rw	1030	-	-	-
1.6.7 IN ENABLE ENC 2	NO, YES	-	REMOTE	rw	1031	-	-	-
1.6.8 ADAPT Id TABLE	10.0 - 200.0	%	100.0	rw	4025	-	-	-
1.6.9 BRUSHLESS	(empty)							
1.6.10 FT DERIVATIVE	1 - 1000	Hz	150	rw	4026	-	-	-
1.6.11 KD GAIN	0 - 100	-	0	rw	4027	-	-	-
1.6.12 DERIVATIVE MODE	FEEDBACK, ERROR, BOTH	-	FEEDBACK	rw	4028	-	-	-
1.6.13 KP KI REGULATOR								
1.6.13.1 KP ID REGULATOR	0.0000 - 3.0000	-	*1)	rw	4029	-	-	-
1.6.13.2 KI ID REGULATOR	0.0000 - 3.0000	-	*1)	rw	4030	-	-	-
1.6.13.3 KP IQ REGULATOR	0.0000 - 3.0000	-	*1)	rw	4031	-	-	-
1.6.13.4 KI IQ REGULATOR	0.0000 - 3.0000	-	*1)	rw	4032	-	-	-
1.6.14 KP UP NOM SPEED	0 - 100	-	5	rw	1090	-	-	-
1.6.15 FIELD WEAK TYPE	TABLE, FEEDBACK	-	TABLE	rw	1091	-	-	-
1.7 PARAM ESTIMATION								
1.7.1 ENABLE EST TAUR	NO, YES	-	NO	rw	1032	-	-	-
1.7.2 STATOR L	0.0 - 3000.0	mH	0.0	rw	1033	-	-	-
1.7.3 ROTOR L	0.0 - 3000.0	mH	0.0	rw	1034	-	-	-
1.7.4 MUTUAL INDUC	0.0 - 3000.0	mH	0.0	rw	1035	-	-	-
1.7.5 ENABLE AUTO TUN	NO, STATIC, DYNAMIC	-	NO	rw	1053	-	-	-
1.8 POWER LOSS CNTRL								
1.8.1 ENABLE LOSS CNTR	NO, YES	-	NO	rw	1045	-	-	-
1.8.2 START THRESHOLD	0 - 2000	V	450	rw	1046	-	-	-
1.8.3 + STOP THRESHOLD	0 - 2000	V	25	rw	1047	-	-	-
1.8.4 ACCEL TIME	0.01 - 600.00	s	15.00	rw	1048/1049	-	-	-
1.8.5 DECEL TIME	0.01 - 600.00	s	5.00	rw	1050/1051	-	-	-
1.8.6 START SPEED	0 - par.1.3.1	rpm	500	rw	1052	-	-	-
1.8.7 TIME LIMIT	0.001 - 30.000	s	10.000	rw	1053	-	-	-
1.9 I1 FUNCTION								
1.9.1 I1 SPEED STOP	NO, YES	-	NO	rw	1054	-	-	-
1.9.2 I1RESET FAULT	NO, YES	-	NO	rw	1055	-	-	-
1.9.3 I1 DC BRAKE	NO, YES	-	NO	rw	1056	-	-	-
1.9.4 OUT RUN	REMOTE, O1..O8	-	O3	rw	4033	-	-	-
1.9.5 OUT FAULT	REMOTE, O1..O8	-	O2	rw	4034	-	-	-
1.9.6 MECHANICAL BRAKE								
1.9.6.1 ENABLE MEC. BRAKE	NO, YES	-	NO	rw	4035	-	-	-
1.9.6.2 IN RUN - SPEED	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4036	-	-	-
1.9.6.3 OUT MEC. BRAKE	REMOTE, O1..O8	-	REMOTE	rw	4037	-	-	-
1.9.6.4 DELAY STOP	0.000 - 30.000	s	0.250	rw	4038	-	-	-
1.9.6.5 PERC In START	0 - 1000	%	30	rw	4039	-	-	-
1.9.6.6 DELAY START	0.000 - 30.000	s	30.000	rw	4040	-	-	-
1.9.6.7 DELAY RAMP START	0.000 - 30.000	s	0.200	rw	4041	-	-	-
1.9.6.8 % In LIMIT SPEED	0 - 1000	%	110	rw	4042	-	-	-
1.9.6.9 DELAY % In LIMIT	0.000 - 30.000	s	1.000	rw	4043	-	-	-
1.9.6.10 LIMIT SPEED	30 - 30000	rpm	1500	rw	4044	-	-	-
1.9.6.11 SPEED FAULT ENC.	0 - 30000	rpm	0	rw	4045	-	-	-
1.9.6.12 DELAY FAULT ENC.	0.000 - 30.000	s	0.200	rw	4046	-	-	-
						-	-	-
1.9.7 IN RESET FAULT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4047	-	-	-

***1) Depends on size**

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
1.10 TORQUE CONTROL								
1.10.1 MAX TORQUE	0 - par.99	%	200	rw	1057	-	-	-
1.10.2 TORQUE SOURCE	REMOTE, AI1..AI5, MOTOPOT, OPERATOR	-	AI3	rw	1058	-	-	-
1.10.3 TORQUE CONTROL	MAX_TORQ, SET_TORQ	-	MAX_TORQ	rw	1059	-	-	-
1.10.4 RAMP TORQUE	0.01 - 600.00	s	1.0	rw	1060	-	-	-
1.10.5 IN DX ENABLE LIM	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4048	-	-	-
1.10.6 IN SX ENABLE LIM	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4049	-	-	-
1.10.7 SAVE MOTOPOT.	NO, YES	-	YES	rw	4050	-	-	-
1.10.8 IN + TORQUE MOT.	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4051	-	-	-
1.10.9 IN - TORQUE MOT.	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4052	-	-	-
1.10.10 TORQUE THRESHOLD	0 - 300	%	100	rw	1061	-	-	-
1.10.11 THRESHOLD DELAY	0.1 - 30.0	s	5.0	rw	1062	-	-	-
1.10.12 OUT TORQUE THRES	REMOTE, O1..O8	-	REMOTE	rw	4053	-	-	-
1.10.13 SAVE SET MANUAL	NO, YES	-	YES	rw	4054	-	-	-
OP * 1.10.14 SET TORQUE OPERAT.								
SET MAN	0 - par.1.10.1	%	0	rw	4055	-	-	-
TORQUE	0 - 300	%	var.	ro	2021	-	-	-
1.10.15 ADAPT PERC TORQ.	10.0 - 200.0	%	100.0	rw	4056	-	-	-
1.10.16 ADAPT TORQ. [Nm]	10.0 - 200.0	%	100.0	rw	4057	-	-	-
1.10.17 IN EN. TORQ. FIL	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4058	-	-	-
1.10.18 TORQUE FIL	0.0 - 100.0	Hz	5.0	rw	4059	-	-	-
1.10.19 F. STOP FIL	0.0 - 100.0	Hz	25.0	rw	4060	-	-	-
1.11 CURRENT CONTROL								
1.11.1 CURRENT THRESHOL	0.0 - 3000.0	A	0.0	rw	1063	-	-	-
1.11.2 THRESHOLD DELAY	0.1 - 30.0	s	3.0	rw	1064	-	-	-
1.11.3 OUT CUR THRESHOL	REMOTE, O1..O8	-	REMOTE	rw	4061	-	-	-
1.11.4 RESET MAX Imax	NO, YES	-	NO	rw	4062	-	-	-
1.12 PWM GENERATOR								
1.12.1 PWM FREQUENCY	0.50 - par.99	KHz	5.00	rw	1065	-	-	-
1.12.2 START PWM FREQ.	0.50 - par.99	KHz	1.00	rw	1085	-	-	-
1.12.3 CHANGE PWM SPEED	0 - 30000	rpm	500	rw	1086	-	-	-
1.13 BRAKE UNIT								
1.13.1 ENABLE	NO, YES	-	YES	rw	1066	-	-	-
1.13.2 BRAKE RESISTANCE	0.1 - 200.0	ohm	*1)	rw	1067	-	-	-
1.13.3 NOMINAL CURRENT	0.0 - 3000.0	A	*1)	rw	1068	-	-	-
1.13.4 5 SEC CURRENT	0.0 - 3000.0	A	*1)	rw	1069	-	-	-
1.14 STALL FAULT								
1.14.1 STALL TIME	0.000 - 30.000	s	5.00	rw	1070	-	-	-
1.14.2 CURRENT LIMIT	0.1 - 3000.0	A	3000.0	rw	1071	-	-	-
1.15 AUTO RESTART								
1.15.1 ENABLE	NO, YES	-	NO	rw	1072	-	-	-
1.15.2 ATTEMPTS	1 - 100	-	5	rw	1073	-	-	-
1.15.3 RESTART DELAY	0.1 - 300.0	s	3.0	rw	1074	-	-	-
1.15.4 1° FAULT	1 - 100	-	1	rw	1075	-	-	-
1.15.5 2° FAULT	1 - 100	-	5	rw	1076	-	-	-
1.15.6 3° FAULT	1 - 100	-	6	rw	1077	-	-	-
1.15.7 4° FAULT	1 - 100	-	0	rw	1078	-	-	-
1.15.8 RESET TIME	0 - 100000	s	3600	rw	1079/1080	-	-	-
1.15.9 OUT RESTART END	REMOTE, O1..O8	-	REMOTE	rw	4063	-	-	-
1.16 DC BRAKING								
1.16.1 DC BRAKE TIME	0.1 - 300.0	s	10.0	rw	1081	-	-	-
1.16.2 DC BRAKE LEVEL	0.0 - 300.0	%	100.0	rw	1082	-	-	-
1.16.3 BRAKE LEVEL RAMP	0.1 - 300.0	s	10.0	rw	1083	-	-	-
1.16.4 DEFLUX TIME	2.0 - 30.0	s	20.0	rw	1084	-	-	-

OP * → Setup OPERATOR importable in the menu BASIC DATA

VARIABLES	RANGE min / max	Um	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
2. DISPLAY VARIABLE							
2.1 GENERAL VARIABLE							
2.1.1 SPEED REFERENCE	- 30000 / +30000	rpm	ro	2000/2001	2001 (long)	1/2	4096 (long)
2.1.2 MOTOR SPEED	- 30000 / +30000	rpm	ro	2002/2003	2002 (long)	3/4	4100 (long)
2.1.3 MOTOR FREQUENCY	0.0 / 800.0	Hz	ro	2004/2005	2003 (long)	5/6	4104 (long)
2.1.4 MOTOR CURRENT	0.0 / 3000.0	A	ro	2006	2004	7	4108
2.1.5 BUS DC VOLTS	0 / 3000	V	ro	2007	2005	8	4112
2.1.6 MOTOR VOLTAGE	0 / 3000	V	ro	2008	2006	9	4116
2.1.7 MEMO MAX Imax	0.0 / 3000.0	A	ro	2009	2007	10	4120
2.1.8 ACTIVE POWER	0.00 / 900.00	Kw	ro	2010/2011	2008 (long)	11/12	4124 (long)
2.1.9 REACTIVE POWER	0.00 / 900.00	KVAr	ro	2012/2013	2009 (long)	13/14	4128 (long)
2.1.10 COS (PHI)	0.000 / 1.000	-	ro	2014	200A	15	4132
2.1.11 I x COS (PHI)	0.0 / 3000.0	A	ro	2015	200B	16	4136
2.1.12 MOTOR SLIP V/F	0 / 1000	rpm	ro	2016	200C	17	4140
2.1.13 CALC MOTOR TORQ.	-10000.0 / +10000.0	Nm	ro	2017/2018	200D (long)	18/19	4144 (long)
2.1.14 MOTOR TORQ.	-10000.0 / +10000.0	Nm	ro	2019/2020	200E (long)	20/21	4148 (long)
2.1.15 MOTOR TORQUE %	-300 / +300	%	ro	2021	200F	22	4152
2.1.16 LAST FAULT	0 - 100	-	ro	2022	2010	23	4156

***1) Dipends on size**

VARIABLES	RANGE min / max	Um	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
2.1.17 INVERTER I x I	0 - 10000	%	ro	2023	2011	24	4160
2.1.18 MOTOR I x I	0 - 10000	%	ro	2024	2012	25	4164
2.1.19 IGBT BRAKE CURR.	0.0 - 3000.0 A	A	ro	2025	2013	26	4168
2.1.20 DIG. INPUT I1..8	0 - 255	-	ro	2026/2027	2014 (long)	27/28	4172 (long)
2.1.21 DIG. INPUT I9.14	0 - 255	-	ro	2028/2029	2015 (long)	29/30	4176 (long)
2.1.22 DIG. OUTPUT O1.8	0 - 255	-	ro	2030/2031	2016 (long)	31/32	4180 (long)
2.1.23 ANALOG INPUT AI1	-100.00 - +100.00	%	ro	2032	2017	33	4184
2.1.24 ANALOG INPUT AI2	-100.00 - +100.00	%	ro	2033	2018	34	4188
2.1.25 ANALOG INPUT AI3	-100.00 - +100.00	%	ro	2034	2019	35	4192
2.1.26 ANALOG INPUT AI4	-100.00 - +100.00	%	ro	2035	201A	36	4256
2.1.27 ANALOG INPUT AI5	-100.00 - +100.00	%	ro	2036	201B	37	4200
2.1.28 ANALOG INPUT AI6	-100.00 - +100.00	%	ro	2037	201C	38	4204
2.1.29 ANALOG INPUT AI7	-100.00 - +100.00	%	ro	2038	201D	39	4208
2.1.30 ANALOG INPUT AI8	-100.00 - +100.00	%	ro	2039	201E	40	4212
2.1.31 ANALOG INPUT AI9	-100.00 - +100.00	%	ro	2040	201F	41	4216
2.1.32 ACTIVE VAR AO0	-100.00 - +100.00	%	ro	2041	2020	42	4220
2.1.33 ACTIVE VAR AO1	-100.00 - +100.00	%	ro	2042	2021	43	4224
2.1.34 ACTIVE VAR. AO2	-100.00 - +100.00	%	ro	2043	2022	44	4228
2.1.35 ACTIVE VAR AO3	-100.00 - +100.00	%	ro	2044	2023	45	4232
** 2.1.36 COUNT AUTORESTAR	0 - 100	-	ro	2045	2024	46	4236
2.1.37 MOTOR CONTROL I	0.0A - 3000.0	A	ro	2046	2025	47	4240
2.1.38 FIRMWARE VERSION	0.00 - 999999.99	A	ro	2047/2048	2026 (long)	48/49	4244 (long)
2.1.39 OPERATE HOURS	0.00h - 100000.00	h	ro	2049/2050	2027 (long)	50/51	4248 (long)
2.1.40 HARDWARE VERSION	0.00 a 300.00	-	ro	9100	-	-	-
2.1.41 LAST RESTORE	DEFAULT, SETUP_1, SETUP_2	-	ro	2074	-	-	-
2.1.42 POWER LOSS COUNT	0 - 30000	-	ro	2053	2028	52	4252
2.1.43 LAST TWO ERR COM	0 - 9999	-	ro	2054	2029	53	4256
2.1.44 COUNT ERROR COM	0 - 30000	-	ro	2055	202A	54	4260
2.1.45 SET TORQUE %	0 - 300	%	ro	2071	202B	55	4264
2.1.46 ENCODER SPEED	- 30000 - +30000	rpm	ro	2072	202C	56	4268
2.1.47 (visualizzazione doppia)							
SET	0 - 300	%	ro	-	-	-	-
TORQUE	0 - 300	%	ro	2021	-	-	-
2.1.48 (visualizzazione doppia)							
SET OP	- 30000 - +30000	rpm	ro	4119	-	-	-
SPEED	- 30000 - +30000	rpm	ro	2002/2003	-	-	-
2.1.49 I MAX MONITOR	0.0 - 3000.0	A	ro	2075	-	-	-
2.1.50 INVERTER ALARM	NONE, CAP_LIFE, PROG_IN, PROG_OUT, AXIS_LIM, COILDMIN, COILDMAX, CELLMAX, DANCUP, BREAK, STO_OPEN	-	ro	2073	202D	57	4272
2.1.51 ANYBUS TYPE	NONE (0), CAN_OPEN (32), PROFIBUS (5), MODB_TCP (147), ETHERCAT (135), PROFINET (150)	-	ro	2076	-	-	-
2.1.52 ANYBUS STATE	SETUP, NW_INIT, WAIT PROCESS, IDLE, PROCESS_ACTIVE, ERROR, EXCEPTION	-	ro	2077	2090	79	4668
2.1.53 ROTOR K CORRECT	0.25 - 2.00	-	ro	2088	-	-	-
2.1.54 I P ADDRESS	000.000.000.000 - 255.255.255.255	-	ro	2089 2090 2091 2092	-	-	-

** This manual is updated to the inverter C400 firmware version: **501XX.XX**

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID modbus TCP/IP RAM (dec)
2.2. DEFAULT DISPLAY								
2.2.1 DEFAULT DIS1	2.1.1 - *2)	-	2.1.1	rw	2056	-	-	-
2.2.2 DEFAULT DIS2	2.1.1 - *2)	-	2.1.2	rw	2057	-	-	-
2.2.3 DEFAULT DIS3	2.1.1 - *2)	-	2.1.3	rw	2058	-	-	-
2.2.4 DEFAULT DIS4	2.1.1 - *2)	-	2.1.4	rw	2059	-	-	-
2.2.5 DEFAULT DIS5	2.1.1 - *2)	-	2.1.46	rw	2060	-	-	-
2.2.6 DEFAULT DIS6	2.1.1 - *2)	-	2.1.5	rw	4064	-	-	-
2.2.7 DEFAULT DIS7	2.1.1 - *2)	-	2.1.15	rw	4065	-	-	-
2.2.8 DEFAULT DIS8	2.1.1 - *2)	-	2.1.49	rw	4066	-	-	-
2.2.9 DEFAULT DIS9	2.1.1 - *2)	-	2.1.16	rw	4067	-	-	-
2.2.10 DEFAULT DIS10	2.1.1 - *2)	-	2.1.38	rw	4068	-	-	-
2.3. FAULT HISTORY								
2.3.1 FAULT 1	0 - 100	-	var.	ro	2061	202E	58	4276
2.3.2 FAULT 2	0 - 100	-	var.	ro	2062	202F	59	4280
2.3.3 FAULT 3	0 - 100	-	var.	ro	2063	2030	60	4284
2.3.4 FAULT 4	0 - 100	-	var.	ro	2064	2031	61	4288
2.3.5 FAULT 5	0 - 100	-	var.	ro	2065	2032	62	4292
2.3.6 FAULT 6	0 - 100	-	var.	ro	2066	2033	63	4296
2.3.7 FAULT 7	0 - 100	-	var.	ro	2067	2034	64	4300
2.3.8 FAULT 8	0 - 100	-	var.	ro	2068	2035	65	4304
2.3.9 FAULT 9	0 - 100	-	var.	ro	2069	2036	66	4308
2.3.10 FAULT 10	0 - 100	-	var.	ro	2070	2037	67	4312
2.4. SETUP OPERATOR								
2.4.1 OPERATOR SET1	1.10.14 - *2)	-	3.1.9.2	ro	4069	-	-	-
2.4.2 OPERATOR SET2	1.10.14 - *2)	-	1.10.14	ro	4070	-	-	-
2.4.3 OPERATOR SET3	1.10.14 - *2)	-	3.1.9.2	ro	4071	-	-	-
2.4.4 OPERATOR SET4	1.10.14 - *2)	-	3.1.9.2	ro	4072	-	-	-
2.4.5 OPERATOR SET5	1.10.14 - *2)	-	3.1.9.2	ro	4073	-	-	-
2.4.6 ACTIVE SET OPER.	1 - 5	-	2	ro	4074	-	-	-

***2) Depends on application**

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
3. APPLICATIONS								
3.1. SPEED								
3.1.1 SPEED COMMANDS								
3.1.1.1 SPEED SOURCE	REMOTE, AI1..AI5, MOTOPOT, OPERATOR	-	AI1	rw	3100	-	-	-
3.1.1.2 IN STOP SPEED	REMOTE, I2..I14, ENABLE	-	I2	rw	4075	-	-	-
3.1.1.3 IN REVERSE SPEED	REMOTE, I2..I14, ENABLE	-	ENABLE	rw	4076	-	-	-
3.1.2 SPEED MAX								
3.1.2.1 SET SPEED MAX1	30 - 24000	rpm	1250	rw	4077	-	-	-
3.1.2.2 SET SPEED MAX2	30 - 24000	rpm	1000	rw	4078	-	-	-
3.1.2.3 SET SPEED MAX3	30 - 24000	rpm	750	rw	4079	-	-	-
3.1.2.4 IN1 SPEED MAX	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4080	-	-	-
3.1.2.5 IN2 SPEED MAX	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4081	-	-	-
3.1.3 SPEED THRESHOLD								
3.1.3.1 SPEED THRESHOLD1	0 - 30000	rpm	100	rw	3101	-	-	-
3.1.3.2 THRESHOLD1 DELAY	0.1 - 30.0	s	0.0	rw	3102	-	-	-
3.1.3.3 OUT THRESHOLD1	REMOTE, O1..O8	-	O1	rw	4082	-	-	-
3.1.3.4 SPEED THRESHOLD2	0 - 30000	rpm	1500	rw	3103	-	-	-
3.1.3.5 THRESHOLD2 DELAY	0.1 - 30.0	s	1.0	rw	3104	-	-	-
3.1.3.6 OUT THRESHOLD2	REMOTE, O1..O8	-	REMOTE	rw	4083	-	-	-
3.1.3.7 SPEED THR STOP	0 - 300	rpm	0	rw	2051	-	-	-
3.1.4 MANUAL								
3.1.4.1 MANUAL SPEED	0 - par. 1.3.1	rpm	300	rw	3105	-	-	-
3.1.4.2 IN ENABLE MANUAL	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4084	-	-	-
3.1.4.3 IN JOG+	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4085	-	-	-
3.1.4.4 IN JOG-	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4086	-	-	-
3.1.5 MOTOPOTENTIOM.								
3.1.5.1 SAVE MOTOPOT.	NO, YES	-	YES	rw	4087	-	-	-
3.1.5.2 IN INCREASE MOT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4088	-	-	-
3.1.5.3 IN DECREASE MOT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4089	-	-	-
3.1.5.4 ACC DEC MOTP SET	0.01 - 600.00	s	10.00	rw	4090/4091	-	-	-
3.1.6 FIXED SPEED								
3.1.6.1 SET SPEED 1	-30000 - +30000	rpm	500	rw	4092	-	-	-
3.1.6.2 SET SPEED 2	-30000 - +30000	rpm	1000	rw	4093	-	-	-
3.1.6.3 SET SPEED 3	-30000 - +30000	rpm	- 500	rw	4094	-	-	-
3.1.6.4 SET SPEED 4	-30000 - +30000	rpm	1500	rw	4095	-	-	-
3.1.6.5 SET SPEED 5	-30000 - +30000	rpm	- 750	rw	4096	-	-	-
3.1.6.6 SET SPEED 6	-30000 - +30000	rpm	-1500	rw	4097	-	-	-
3.1.6.7 SET SPEED 7	-30000 - +30000	rpm	-1000	rw	4098	-	-	-
3.1.6.8 IN1 SPEED	REMOTE, I2..I14, ENABLE	-	I3	rw	4099	-	-	-
3.1.6.9 IN2 SPEED	REMOTE, I2..I14, ENABLE	-	I4	rw	4100	-	-	-
3.1.6.10 IN3 SPEED	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4101	-	-	-
3.1.7. FIXED ACC. RAMPS								
3.1.7.1 SET ACC1	0.01 - 600.00	s	1.00	rw	4102/4103	-	-	-
3.1.7.2 SET ACC2	0.01 - 600.00	s	2.00	rw	4104/4105	-	-	-
3.1.7.3 SET ACC3	0.01 - 600.00	s	3.00	rw	4106/4107	-	-	-
3.1.7.4 IN1 ACC	REMOTE, I2..I14, ENABLE	-	I5	rw	4108	-	-	-
3.1.7.5 IN2 ACC	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4109	-	-	-
3.1.8. FIXED DEC. RAMPS								
3.1.8.1 SET DEC1	0.01 - 600.00	s	1.00	rw	4110/4111	-	-	-
3.1.8.2 SET DEC2	0.01 - 600.00	s	2.00	rw	4112/4113	-	-	-
3.1.8.3 SET DEC3	0.01 - 600.00	s	3.00	rw	4114/4115	-	-	-
3.1.8.4 IN1 DEC	REMOTE, I2..I14, ENABLE	-	I6	rw	4116	-	-	-
3.1.8.5 IN2 DEC	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4117	-	-	-
3.1.9. MANUAL OPERATOR								
3.1.9.1 SAVE MAN OPERAT.	NO, YES	-	YES	rw	4118	-	-	-
OP * 3.1.9.2 SET MAN OPERATOR								-
SET OP	-30000 - +30000	rpm	0.rpm	rw	4119	-	-	-
SPEED	-30000 - +30000	rpm	var.	ro	2002/2003	-	-	-
3.1.10. SPECIAL FUNCTION								
3.1.10.1 MOTOR ENABLE OUT	MOT_1, MOT_2		MOT_1	rw	4120	-	-	-
3.1.10.2 OUT ENABLE MOT 1	REMOTE, O1..O8	-	REMOTE	rw	4121	-	-	-
3.1.10.3 OUT ENABLE MOT 2	REMOTE, O1..O8	-	REMOTE	rw	4122	-	-	-

OP * → OPERATOR-type setup importable in the menù BASIC DATA.

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
4. INPUT/OUTPUT								
4.1. DIGITAL INPUT								
4.1.1 INVERT I2	NO, YES	-	NO	rw	4123	-	-	-
4.1.2 INVERT I3	NO, YES	-	NO	rw	4124	-	-	-
4.1.3 INVERT I4	NO, YES	-	NO	rw	4125	-	-	-
4.1.4 INVERT I5	NO, YES	-	NO	rw	4126	-	-	-
4.1.5 INVERT I6	NO, YES	-	NO	rw	4127	-	-	-
4.1.6 INVERT I7	NO, YES	-	NO	rw	4128	-	-	-
4.1.7 INVERT I8	NO, YES	-	NO	rw	4129	-	-	-
4.1.8 INVERT I9	NO, YES	-	NO	rw	4130	-	-	-
4.1.9 INVERT I10	NO, YES	-	NO	rw	4131	-	-	-
4.1.10 INVERT I11	NO, YES	-	NO	rw	4132	-	-	-
4.1.11 INVERT I12	NO, YES	-	NO	rw	4133	-	-	-
4.1.12 INVERT I13	NO, YES	-	NO	rw	4134	-	-	-
4.1.13 INVERT I14	NO, YES	-	NO	rw	4135	-	-	-
4.2. DIGITAL OUTPUT								
4.2.1 INVERT O1	NO, YES	-	NO	rw	4136	-	-	-
4.2.2 INVERT O2	NO, YES	-	YES	rw	4137	-	-	-
4.2.3 INVERT O3	NO, YES	-	NO	rw	4138	-	-	-
4.2.4 INVERT O4	NO, YES	-	NO	rw	4139	-	-	-
4.2.5 INVERT O5	NO, YES	-	NO	rw	4140	-	-	-
4.2.6 INVERT O6	NO, YES	-	NO	rw	4141	-	-	-
4.2.7 INVERT O7	NO, YES	-	NO	rw	4142	-	-	-
4.2.8 INVERT O8	NO, YES	-	NO	rw	4143	-	-	-
4.3. ANALOG INPUT								
4.3.1 ANALOG INPUT AI1								
4.3.1.1 SCALE	+/- 300	%	100.00	rw	4144	-	-	-
4.3.1.2 OFFSET	+/- 50	%	0.00	rw	4145	-	-	-
4.3.1.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4146	-	-	-
4.3.2 ANALOG INPUT AI2								
4.3.2.1 SCALE	+/- 300	%	100.00	rw	4147	-	-	-
4.3.2.2 OFFSET	+/- 50	%	0.00	rw	4148	-	-	-
4.3.2.3 TYPE INPUT	0/+10V, -10/+10V, 0/20mA, 4/20mA	-	4/20mA	rw	4149	-	-	-
4.3.3 ANALOG INPUT AI3								
4.3.3.1 SCALE	+/- 300	%	100.00	rw	4150	-	-	-
4.3.3.2 OFFSET	+/- 50	%	0.00	rw	4151	-	-	-
4.3.3.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4152	-	-	-
4.3.4 ANALOG INPUT AI4								
4.3.4.1 SCALE	+/- 300	%	100.00	rw	4153	-	-	-
4.3.4.2 OFFSET	+/- 50	%	0.00	rw	4154	-	-	-
4.3.4.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4155	-	-	-
4.3.5 ANALOG INPUT AI5								
4.3.5.1 SCALE	+/- 300	%	100.00	rw	4156	-	-	-
4.3.5.2 OFFSET	+/- 50	%	0.00	rw	4157	-	-	-
4.3.5.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4158	-	-	-
4.3.6 ANALOG INPUT AI6								
4.3.6.1 SCALE	+/- 300	%	100.00	rw	4159	-	-	-
4.3.6.2 OFFSET	+/- 50	%	0.00	rw	4160	-	-	-
4.3.6.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4161	-	-	-
4.3.7 ANALOG INPUT AI7								
4.3.7.1 SCALE	+/- 300	%	100.00	rw	4162	-	-	-
4.3.7.2 OFFSET	+/- 50	%	0.00	rw	4163	-	-	-
4.3.7.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4164	-	-	-
4.3.8 ANALOG INPUT AI8								
4.3.8.1 SCALE	+/- 300	%	100.00	rw	4165	-	-	-
4.3.8.2 OFFSET	+/- 50	%	0.00	rw	4166	-	-	-
4.3.8.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4167	-	-	-
4.3.9 ANALOG INPUT AI9								
4.3.9.1 SCALE	+/- 300	%	100.00	rw	4168	-	-	-
4.3.9.2 OFFSET	+/- 50	%	0.00	rw	4169	-	-	-
4.3.9.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4170	-	-	-
4.4. ANALOG OUTPUT								
4.4.1. OUTPUT VARIABLES								
4.4.1.1 MOTOR CURRENT %	+/- 100.00	%	var.	ro	2078	-	-	-
4.4.1.2 SET SPEED F %	+/- 100.00	%	var.	ro	2079	-	-	-
4.4.1.3 MOTOR SPEED %	+/- 100.00	%	var.	ro	2080	-	-	-
4.4.1.4 MOTOR SPEED F %	+/- 100.00	%	var.	ro	2081	203C	74	4332
4.4.1.5 MOTOR TORQUE %	+/- 300.00	%	var.	ro	2082	-	-	
4.4.1.6 MOTOR TORQUE F %	+/- 300.00	%	var.	ro	2083	203D	75	4336
4.4.1.7 REMOTE SET 1 %	+/- 100.00	%	var.	ro	2084	-	-	-
4.4.1.8 REMOTE SET 2 %	+/- 100.00	%	var.	ro	2085	-	-	-
4.4.1.9 REMOTE SET 3 %	+/- 100.00	%	var.	ro	2086	-	-	-
4.4.1.10 REMOTE SET 4 %	+/- 100.00	%	var.	ro	2087	-	-	-
4.4.2. ANALOG OUTP. AO0								
4.4.2.1 VAR DISPLAY	1 - 10	-	1	rw	4171	-	-	-
4.4.2.2 SCALE	+/- 300.00	%	100.00	rw	4172	-	-	-
4.4.2.3 OFFSET	+/- 10.00	%	0.00	rw	4173	-	-	-
4.4.2.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4174	-	-	-
4.4.3. ANALOG OUTP. AO1								
4.4.3.1 VAR DISPLAY	1 - 10	-	3	rw	4175	-	-	-
4.4.3.2 SCALE	+/- 300.00	%	100.00	rw	4176	-	-	-
4.4.3.3 OFFSET	+/- 10.00	%	0.00	rw	4177	-	-	-
4.4.3.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4178	-	-	-

*** To store parameter in eeprom sum 10000 at the MODBUS address.**

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP RAM (dec)
4.4.4. ANALOG OUTP. AO2								
4.4.4.1 VAR DISPLAY	1 - 10	-	3	rw	4179	-	-	-
4.4.4.2 SCALE	+/- 300.00	%	100.00	rw	4180	-	-	-
4.4.4.3 OFFSET	+/- 10.00	%	0.00	rw	4181	-	-	-
4.4.4.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4182	-	-	-
4.4.5. ANALOG OUTP. AO3								
4.4.5.1 VAR DISPLAY	1 - 10	-	5	rw	4183	-	-	-
4.4.5.2 SCALE	+/- 300.00	%	100.00	rw	4184	-	-	-
4.4.5.3 OFFSET	+/- 10.00	%	0.00	rw	4185	-	-	-
4.4.5.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4186	-	-	-
5. SERIAL COMUNICAT								
5.1 ENABLE MODBUS	DISABLE, ENABLE	-	DISABLE	rw	258	-	-	-
5.2. MODBUS CONFIG								
5.2.1 PROTOCOL	MODBUS, ROWAN	-	MODBUS	rw	4187	-	-	-
5.2.2 ADDRESS	1 - 247	-	2	rw	4188	-	-	-
5.2.3 BAUD RATE	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200	-	9600	rw	4189	-	-	-
5.2.4 PARITY	NONE, EVEN, ODD	-	NONE	rw	4190	-	-	-
5.2.5 BIT STOP	1 - 2	-	1	rw	4191	-	-	-
5.2.6 RESET ERR. COUNT	NO, YES	-	NO	rw	601	-	-	-
5.2.7 INACTIVITY TIME	0.00 - 30.00	-	30.00	rw	602	-	-	-
5.3. ANYBUS CONFIG								
5.3.1 ANYBUS ADDRESS	0 - 250	-	0	rw	4192	-	-	-
5.3.2 CYCLIC CONFIG								
5.3.2.1 PZD1 READ	0 - 250	-	0	rw	4193	-	-	256
5.3.2.2 PZD2 READ	0 - 250	-	0	rw	4194	-	-	257
5.3.2.3 PZD3 READ	0 - 250	-	0	rw	4195	-	-	258
5.3.2.4 PZD4 READ	0 - 250	-	0	rw	4196	-	-	259
5.3.2.5 PZD5 READ	0 - 250	-	0	rw	4197	-	-	260
5.3.2.6 PZD6 READ	0 - 250	-	0	rw	4198	-	-	261
5.3.2.7 PZD7 READ	0 - 250	-	0	rw	4199	-	-	262
5.3.2.8 PZD8 READ	0 - 250	-	0	rw	4200	-	-	263
5.3.2.9 PZD1 WRITE	0 - 250	-	0	rw	4201	-	-	0
5.3.2.10 PZD2 WRITE	0 - 250	-	0	rw	4202	-	-	1
5.3.2.11 PZD3 WRITE	0 - 250	-	0	rw	4203	-	-	2
5.3.2.12 PZD4 WRITE	0 - 250	-	0	rw	4204	-	-	3
5.3.2.13 PZD5 WRITE	0 - 250	-	0	rw	4205	-	-	4
5.3.2.14 PZD6 WRITE	0 - 250	-	0	rw	4206	-	-	5
5.3.2.15 PZD7 WRITE	0 - 250	-	0	rw	4207	-	-	6
5.3.2.16 PZD8 WRITE	0 - 250	-	0	rw	4208	-	-	7
5.3.3 ETHERNET CONFIG								
5.3.3.1 DHCP Option	DISABLE, ENABLE	-	DISABLE	rw	4224	-	-	-
5.3.3.2 IP Field 1	0 - 255	-	0	rw	4225	-	-	-
5.3.3.3 IP Field 2	0 - 255	-	0	rw	4226	-	-	-
5.3.3.4 IP Field 3	0 - 255	-	0	rw	4227	-	-	-
5.3.3.5 IP Field 4	0 - 255	-	0	rw	4228	-	-	-
5.3.3.6 NETMASK Field 1	0 - 255	-	0	rw	4229	-	-	-
5.3.3.7 NETMASK Field 2	0 - 255	-	0	rw	4230	-	-	-
5.3.3.8 NETMASK Field 3	0 - 255	-	0	rw	4231	-	-	-
5.3.3.9 NETMASK Field 4	0 - 255	-	0	rw	4232	-	-	-
5.3.3.10 GATEWAY Field 1	0 - 255	-	0	rw	4233	-	-	-
5.3.3.11 GATEWAY Field 2	0 - 255	-	0	rw	4234	-	-	-
5.3.3.12 GATEWAY Field 3	0 - 255	-	0	rw	4235	-	-	-
5.3.3.13 GATEWAY Field 4	0 - 255	-	0	rw	4236	-	-	-
PARAMETRI 100.								
100.1 MOT CONTROL TYPE	V/F, VECT_ENC	-	V/F	rw	100	203A	72	4324
100.2 RESET LAST FAULT	NO, YES	-	NO	rw	101	-	-	-
100.3 MENU OPERATOR	DEFAULT, BLOCK, OPERATOR, OP_BLOCK	-	DEFAULT	rw	4209	-	-	-
100.4 PAR.99 BLOCK	NO, YES	-	NO	rw	102	-	-	-
100.5 APPLICATION	SPEED, AXIS, REGUL, GEN_AFE, CUSTOM1, WINDER	-	SPEED	rw	103	203B	73	4328
100.6 SETUP								
100.6.1 RESTORE SETUP	DEFAULT, SETUP_1, SETUP_2	-	DEFAULT	rw	4210	-	-	-
100.6.2 ENABLE RESTORE	NO, YES	-	NO	rw	4211	-	-	-
100.6.3 SAVE SETUP	SETUP_1, SETUP_2	-	SETUP_1	rw	4212	-	-	-
100.6.4 ENABLE SAVE	NO, YES	-	NO	rw	4213	-	-	-
100.6.5 IN START RESTORE	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4214	-	-	-
100.6.6 IN RESTORE SETUP	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4215	-	-	-
100.6.7 TYPE RESTORE	FULL, QUICK	-	FULL	rw	4216	-	-	-
100.6.8 Copy KEY >> INV	0 - 100	-	0	rw	4217	-	-	-
100.6.9 Copy INV >> KEY	0 -100	-	0	rw	4218	-	-	-
100.7 ALARM SETUP								
100.7.1 ALARM PROG IN	NO, YES	-	YES	rw	4219	-	-	-
100.7.2 ALARM PROG OUT	NO, YES	-	YES	rw	4220	-	-	-

These tables are uselful when new functions of the inverter are assigned to the inverter INPUT/OUTPUT resources and it is necessary to verify that the same hasnt been previousely programmed for another function. When any assignation in each buffer areas (WORKING, SETUP1, SETUP2) is changed, it is better to write this information in these tables, in order to have the real assignations outlook and to prevent command problems. An alarm system is enabled in default mode, in which the FAULT flashing light warns in case of assignation of a resource already in use (see paragraph **Function assignation to INPUT/OUTPUT resources** in Chapter 14 or Chapter 17 **INVERTER FAULTS AND ALARMS**).

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
100.6.5 IN START RESTORE	REMOTE			
100.6.6 IN RESTORE SETUP	REMOTE			
1.5.9.8 MIN SPEED UNLOCK	REMOTE			
1.6.7 IN ENABLE ENC 2	REMOTE			
1.9.6.2 IN RUN - SPEED	REMOTE			
1.9.7 IN RESET FAULT	REMOTE			
1.10.5 IN DX ENABLE LIM	REMOTE			
1.10.6 IN SX ENABLE LIM	REMOTE			
1.10.8 IN + TORQUE	REMOTE			
1.10.9 IN - TORQUE	REMOTE			
1.10.17 IN EN TORQ. FIL	REMOTE			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.1.2 IN STOP SPEED	I2			
3.1.1.3 IN REVERSE SPEED	ENABLE			
3.1.2.4 IN1 SPEED MAX	REMOTE			
3.1.2.5 IN2 SPEED MAX	REMOTE			
3.1.4.2 IN ENABLE MANUAL	REMOTE			
3.1.4.3 IN JOG+	REMOTE			
3.1.4.4 IN JOG-	REMOTE			
3.1.5.2 IN INCREASE MOT	REMOTE			
3.1.5.3 IN DECREASE MOT	REMOTE			
3.1.6.8 IN1 SPEED	I3			
3.1.6.9 IN2 SPEED	I4			
3.1.6.10 IN3 SPEED	REMOTE			
3.1.7.4 IN1 ACC	I5			
3.1.7.5 IN2 ACC	REMOTE			
3.1.8.4 IN1 DEC	I6			
3.1.8.5 IN2 DEC	REMOTE			

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
1.9.4 OUT RUN	O3			
1.9.5 OUT FAULT	O2			
1.9.6.3 OUT MEC. BRAKE	REMOTE			
1.10.12 OUT TORQUE THRES	REMOTE			
1.11.3 OUT CUR THRESHOL	REMOTE			
1.15.9 OUT RESTART END	REMOTE			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.3.3 OUT THRESHOLD1	O1			
3.1.3.6 OUT THRESHOLD2	REMOTE			
3.1.10.2 OUT ENABLE MOT 1	REMOTE			
3.1.10.3 OUT ENABLE MOT 2	REMOTE			

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
1.10.2 TORQUE SOURCE	AI3			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.1.1 SPEED SOURCE	AI1			

HOW TO CUSTOMIZE THE KEYBOARD DISPLAYS

At inverter start, DISPLAY STATUS is displayed, concerning one of the 10 default variables drawn from 2.1 DISPLAY VARIABLE menu. These displays may be changed with other variables available in 2.1 DISPLAY VARIABLE menu or with those of the enabled application, by selecting them by the ten 2.2 DEFAULT DISPLAY menu parameters. For the personalization description, see paragraph **DISPLAY STATUS DESCRIPTION** at the beginning of Chapter 10.

HOW TO CUSTOMIZE THE KEYBOARD SETUPS

When the keyboard is remoted to use it as setup terminal, it is advised to use the OPERATOR function, which customizes BASIC DATA menu by selecting thoses parameters that are necessary to the operator. This way by pressing PROGRAM key, the operator can access directly to the setups he is interested in, without scrolling the complete menu.

For the personalization description, see paragraph **BASIC DATA menu in OPERATOR MODE description** at the beginning of Chapter 10.

HOW TO BLOCK THE PARAMETERS ACCESS

Enter 100. parameters menu.

- By setting par.100.3 OPERATOR MENU, the following blocking operations are possible:

  - par.100.3= **BLOCK**; only the 5 default displays can be selected by the keyboard and it is not possible to enter any parameter programming by PROGRAM key.

  - par.100.3= **OP_BLOCK**; the 5 default displays can be selected by the keyboard and it is possible to enter BASIC DATA parameters in OPERATOR mode (customized basic setups) programming by PROGRAM key.

- By setting par.100.4 PAR.99 BLOCK= YES, it is possible to block the access to standard parameters, both in manual and in serial mode.

INPUT/OUTPUT resources function assignation

Caution !

When commands are assigned to digital/analog inputs and to digital outputs in the same application, it is necessary to verify that the same hasnt been previousely used in other functions, because this might cause functioning problems. An alarm system is enabled in default mode, in which the FAULT flashing light warns in case of assignation of a resource already in use and the alarm reason is displayed in **var.2.1.50 INVERTER ALARM**:

- If the same digital input is assigned in two or more parameters, the fault light starts flashing and **PROG_IN** string is displayed in **var.2.1.50 INVERTER ALARM**.

- If the same digital output is assigned in two or more parameters, the fault light starts flashing and **PROG_OUT** string is displayed in **var.2.1.50 INVERTER ALARM**.

In case of alarm, it is necessary to check where I/O have already been assigned; to make this easier, see the table in Chapter 13 **I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES**; these tables show all I/O resources assignation parameters and their default setups (it is advised to write all new assignations as well).

In different applications it is possible to use the same resources; e.g. I5 input can be used both in speed control application (par.100.5 APPLICATION= SPEED), and in position control application (par.100.5 APPLICATION= AXIS), since they are never active at the same time.

It is possible to assign the same input (analog/digital) or output (only digital) to different functions, but they must not clash with each other; in this case it is necessary to disable the multiple assignation alarm as follows:

If digital inputs multiple assignation is necessary, you must disable the alarm by setting **par.100.7.1 ALARM PROG IN= NO**.

If digital outputs multiple assignation is necessary, you must disable the alarm by setting **par.100.7.2 ALARM PROG out= NO**.

e.g. I5 input can select both a fixed acceleration ramp by par.3.1.7.4 IN1 ACC= I5 and a fixed deceleration ramp by par.3.1.8.4 IN1 DEC= I5.

On the contrary, analog outputs assignation is univocal and it is performed by selecting among the possible variables from 4.4.1 OUTPUT VARIABLES. E.g. If you want to assign AO0 analog output variable nr 1 in var.4.4.1.1 MOTOR CURRENT%, par.4.4.2.1 VAR DISPLAY= 1 must be setup.

Motor manual rotation test by the keyboard

Motor rotation commands by the keyboard are possible only at active RUN (I1 ON).

In standard setup, the test can be performed directly by BASIC DATA menu and in any case by 1.4 TEST MANUAL menu.

Rotation speed is set by par.1.4.1 TEST MANU SPEED, while rotation is set by UP and DOWN keys.

For a complete description of the test, see paragraph **1.4.1 TEST MANUAL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed external regulation modes and speed reversing command

By par.3.1.1.1 SPEED SOURCE the following regulation modes can be selected:

- **REMOTE**= Regulation from a value transmitted in serial mode by 300 address control variable.
SPEED REFERENCE SETUP IN SERIAL MODE.
At inverter start, if no value is transmitted, the set is 0.
See enclosure: **Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION**.

- **AI1...AI5**= Speed regulation by the selected analog input.
100% from the (+/-10VDC) input corresponds to the value set in par.1.3.1 MAX MOTOR SPEED, while the signal polarity determines the motor rotation direction, both in scalar and in vector control**; in case of bidirectional regulation by +/-10Vdc, it is advised to set par.1.3.2 MIN MOTOR SPEED= 0rpm, in order to avoid irregular functioning by analog reference at 0Vdc.** Default speed can be regulated in monodirectional way by AI1 input with par.3.1.1.1 SPEED SOURCE= **AI1** and par.4.3.1.3 TYPE INPUT= **0/+10V**.
For bidirectional regulation, set par.4.3.1.3 TYPE INPUT= **-10V/+10V**.

- **MOTOPOT**= Speed regulation by 2 increase/decrease motopotentiometer-type digital inputs.
Digital inputs must be programmed in par.3.1.5.1 and 3.1.5.2.

- **OPERATOR**= Speed setup by the keyboard by par.3.1.9.2 SET MAN OPERATOR
Each regulatiom is limited to the max. value set in par.1.3.1 MAX MOTOR SPEED.
To enable the speed reversing command, assign one digit input to par. 3.1.1.3 IN REVERSE SPEED (Note: always verify that it is not already been assigned, see chapt. 13).

For a complete parameters description, see paragraph **3.1.1. SPEED COMMANDS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Jog manual commands enabling by digital inputs

As for JOG function, 3 digital inputs must be enabled:

Digital input for JOG+ and JOG- commands activation in par.3.1.4.2 IN ENABLE MANUAL;

Digital input for JOG+ command (positive rotation direction, counterclockwise from shaft side) in par.3.1.4.3 IN JOG+;

Digital input for JOG- command (negative rotation direction, clockwise from shaft side) in par.3.1.4.4 IN JOG-.

JOG speed can be set in par.3.1.4.1 MANUALSPEED.

For a complete setups description, see paragraph **3.1.4 MANUAL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Motor current thresholds

It is possible to set a motor current threshold and to assign it a digital output.

Threshold setups (CURRENT THRESHOLD) are:

Par.1.11.1 CURRENT THRESHOLD= threshold level

Par.1.11.2 THRESHOLD DELAY= intervention delay

Par.1.11.3 OUT CUR THRESHOL= output assignation.

For a complete parameters description, see paragraph **1.11. CURRENT CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Motor speed thresholds

It is possible to set 2 motor speed thresholds and to assign them digital outputs.

The first threshold setups (THRESHOLD1) are:
Par.3.1.3.1 SPEED THRESHOLD1= threshold level
Par.3.1.3.2 THRESHOLD1 DELAY= intervention delay
Par.3.1.3.3 OUT THRESHOLD1= output assignation.
The second threshold setups (THRESHOLD2) are:
Par.3.1.3.4 SPEED THRESHOLD2= threshold level
Par.3.1.3.5 THRESHOLD2 DELAY= intervention delay
Par.3.1.3.6 OUT THRESHOLD2= output assignation.
For a complete parameters description, see paragraph **3.1.3. SPEED THRESHOLD menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Max. speed limits selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 max. speed limits can be selected.

If no selection is performed, the basic limit set in par.1.3.1 MAX MOTOR SPEED remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.2. SPEED MAX menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Fixed speed sets selection by digital inputs

By binary combination of 3 digital inputs to be enabled, 7 fixed speed sets can be selected.

If no selection is performed, the basic limit set in par.3.1.1.1 SPEED SOURCE remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.6. FIXED SPEED menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed set acceleration ramps selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 acceleration ramps can be selected.

If no selection is performed, the basic limit set in par.1.2.1 RAMP ACCEL TIME remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.7. FIXED ACC. RAMPS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed set deceleration ramps selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 deceleration ramps can be selected.

If no selection is performed, the basic limit set in par.1.2.2 RAMP DECEL TIME remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.8. FIXED DEC. RAMPS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Automatic change of ramp depending on the motor speed set

By setting par.1.2.5 FUNC. CHANGE RAMP=YES. It is useful, for example, for commanding compressors; in this case, in fact, it is useful starting with a very low ramp up to a certain speed then, rapidly accelerating; this is to limit high current peaks when there is a cold start.
For a complete description of this function and its related setups, see paragraph.**1.2.5 FUNC. CHANGE RAMP menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

"S" Ramps on speed set

By setting par.1.2.3 ENABLE S RAMP =YES. It is useful to avoid mechanical stress when there are fast stops; when commanding lifts, it joins the fast speed to the slow speed for bringing softly near to the exit floor; the joining level can be set by par.1.2.4 ROUNDING FILTER.
For a complete description of this function and its related setups, see paragraph.1.2.3 ENABLE S RAMP menu **parameters description*1.2. SPEED RAMP"*** in Chapter 10 PARAMETERS AND DISPLAYS.

Reaction to voltage dips

In case of power supply line voltage dips, the inverter can be programmed to perform 2 different reactions:

- RUN stop under a BUSDC limit.

- attemp to avoid the machine block by speed decreasing.

In both cases, voltage dips are counted in **var.2.1.45 POWER LOSS COUNT**;

For a complete description of this function and its related setups, see paragraph **1.8. POWER LOSS CNTR menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Direct current braking

In order to enable the DC braking, the RUN input must be assigned the related function, by setting par.1.9.3 I1 DC BRAKE= YES (see paragraph **1.9 I1 FUNCTION menu parameters description**).

This way, at RUN disabling the DC braking cycle begins according to the parameters set in 1.16 DC BRAKING menu.

For a complete description of this function and its related setups, see paragraph **1.16. DC BRAKING menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed JUMP Function

With this function on, you can avoid resonances on the mechanical transmission which are caused by certain motor speeds. It consent to skip two different speed sets, which are stored in Par.1.5.12.1 JUMP SET1 and Par.1.5.12.2. JUMP SET2. Please see also parameter menu in cap.10 PARAMETERS AND VISUALIZATIONS for detailed description and instructions about this features.

MECHANICAL BRAKE in LIFTING SYSTEMS ((LIFT function)

This function must be enabled by par.1.9.6.1 ENABLE MEC. BRAKE= YES. Moreover, it is necessary to:

- Assign an inverter digital output for brake command in par.1.9.6.3 OUT MEC. BRAKE.
- Enable the RUN disabling with deceleration ramp by setting par.1.9.1 SPEED STOP= YES.
- Set par.1.3.2 MIN MOTOR SPEED= 0.
- If necessary, enable the unblock fault status by RUN commands setting par.1.9.2I1 RESET FAULT= YES.

The remaining parameters related to mechanical brake are in menu: 1.9.6 MECHANICAL BRAKE in Chapter 10.

STOP AND START CYCLES DESCRIPTION BY MECHANICAL BRAKE

Start cycle:

The start cycle begins by RUN enabling, which can be performed as follows:

- by I1 digital input (or serial flag) for one rotation direction
- by the digital input (or serial flag) assigned in par.1.9.6.2 IN RUN SPEED for the opposite rotation direction.

At RUN start, the timer set in par.1.9.6.6 DELAY START starts, exceeding which, brake is unblocked; if during this period of time the motor current is higher than the value set in par.1.9.5. PERC In START, brake is unblocked automatically.

Only in vectorial control, at RUN start, a second timer starts, which can be set in par.1.9.6.7 DELAY RAMP START; at time over, the speed set starts the acceleration ramp up to the set value.

According to your needs, brake can also be unblocked as follows:

- only when DELAY START time is up, so the current control is excluded by setting par.1.9.6.5 PERC In START= 1000%.
- Only after PERC In START current threshold is exceeded, so the timed brake activation is excluded by setting par.1.9.6.6 DELAY START= 30.000s (NOTE: default status).

During the start cycle, when the speed set ramp exceeds 1/3 of the value set in par.1.9.6.10 LIMIT SPEED, a control on the motor absorbed current is enabled: if the current exceeds the value set in par.1.9.6.8 % In LIMIT SPEED for a longer period of time than that set in par.1.9.6.9 DELAY % In LIMIT, the max. speed will be limited by par.1.9.6.10 LIMIT SPEED for all active RUN time. Only after a stop cycle has been performed, speed limitation is excluded before the following start cycle begins; this function is important when motors are used whose speeds higher than the nominal one, that is in constant power zones, where available torque may be lower than 50%. This avoids reaching high speeds with heavy loads.

Suggestions concerning the SCALAR function:

During the start cycle the scalar can use the current limitation function by menu par.1.5.11 CURRENT LIMIT, with which both ramp block or PI regulator functions can be set, in order to avoid continuous current increase during DELAY START time (see par. “Motor max. current limitation and BOOST voltage functions" in Chapter 15).

In scalar mode it is advised not to use DELAY START time to start the brake, but only the current overcoming by par. 1.9.6.5 PERC In START for safety reasons. Then set par. 1.9.6.6 DELAY START= 30.000s.

To prevent high currents values when the motor is supplied with brake stopped, it is advised to set the min. speed at twice the motor slip (see par. 1.5.2 MIN SPEED % SLIP).

Suggestions concerning the VECTOR function:

Don't use DELAY START time to start braking in vectorial mode, but only the current overcoming by par. 1.9.6.5 PERC In START for safety reasons. Then set par. 1.9.6.6 DELAY START= 30.000s.

Vector control by set speed at 0, enables load controlling as mechanical brake does, so it is important to use DELAY RAMP START time to unblock the brake even if the motor is not rotating, this way limiting brake wear and tear. When the machine is started, the speed set is still 0 (with brake blocked); the set starts its acceleration ramp only after DELAY RAMP START time. To unblock the brake before acceleration ramp starts, set in par. 19.6.5 PERC In START a value which is lower than the motor absorbtion at rate start.

Stop cycle:

When rate commands are disabled, the motor speed is set at 0 by the enabled deceleration ramp; as soon as the speed set reaches VF MIN SPEED min. speed in scalar mode, or speed 0 in vector mode, brake is blocked, the count of the time set in 19.6.4 DELAY STOP begins and when this value is exceeded, RUN is disabled.

Caution !

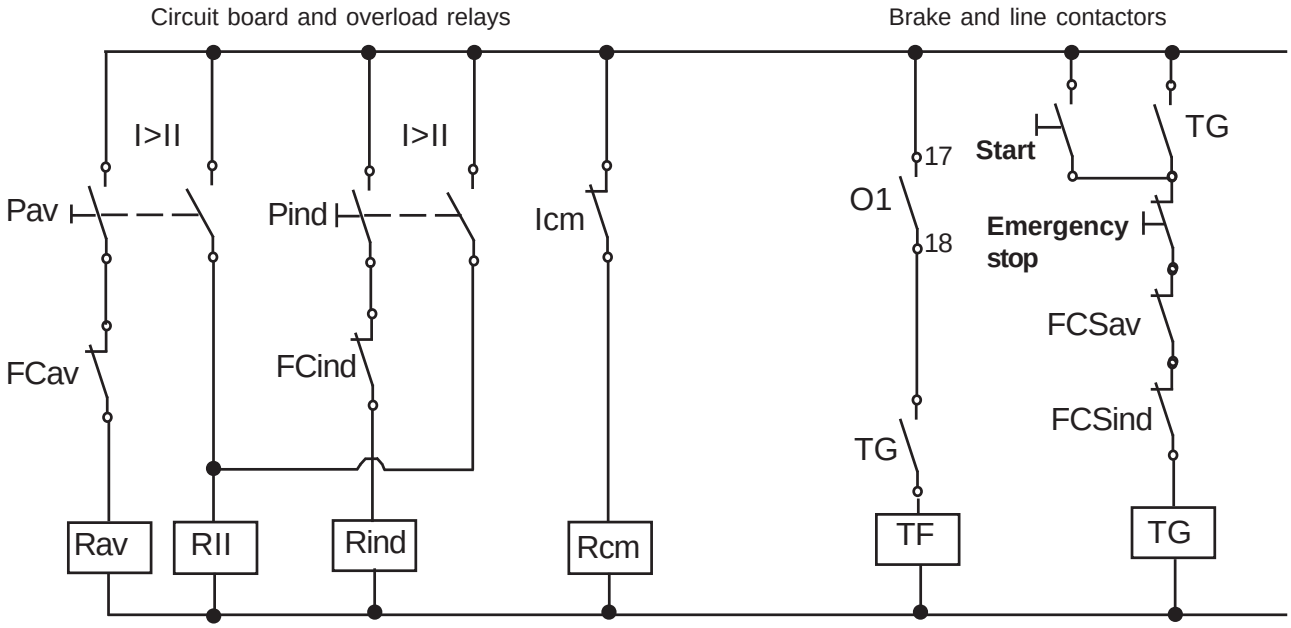
When RUN is stopped even if (I1 or IN RUN SPEED) commands are enabled, e.g. in case of fault or if in scalar control speed is below VF_MIN_SPEED, the brake blocks instantly, and at each internal flag reactivation of RUN command the mechanical brake START CYCLE is performed.

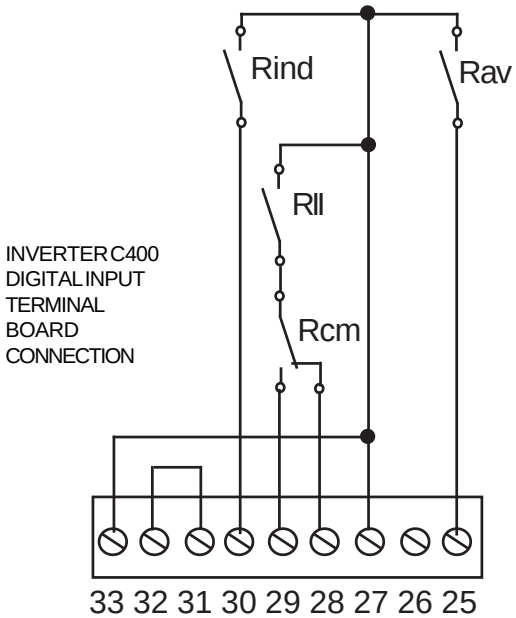
By mechanical brake set ENABLE_MEC._BRAKE= YES, it is possible to enable fault 10, encoder fault, in par. 1.9.6.11 SPEED FAULT_ENC. And 1.9.6.12 DELAY_FAULT_ENC.

EXAMPLE FOR LIFTING COMMAND BY MECHANICAL BRAKE IN VECTOR MODE

For this example, set the following parameters:

100.1 MOT CONTROL TYPE= VECT_ENC (vector function) **1.3.1 MAX MOTOR SPEED= 1900rpm** (absolute max. speed) **1.3.2 MIN MOTOR SPEED = 0.rpm** **1.5.2 MIN SPEED % SLIP = 200%** **3.1.1.3 IN REVERSE SPEED =REMOTE** **3.1.3.3 OUT THRESHOLD1 =REMOTE** **3.1.6.1 SET SPEED 1 =750 rpm** (low speed) **3.1.6.3 SET SPEED 3 =1600 rpm** (speed limited by external device) **3.1.6.5 SET SPEED 5 =1900 rpm** (second speed) **3.1.6.8 IN 1 SPEED =I3** **3.1.6.9 IN 2 SPEED =I4** **3.1.6.10 IN 3 SPEED =I5** **3.1.7.4 IN1 ACC =REMOTE** **3.1.8.4 IN1 DEC =REMOTE**	**1.9.1 I1 SPEED STOP= YES** **1.9.2 I1 RESET FAULT= YES** **1.9.4 OUT RUN = REMOTE** **1.9.5 OUT FAULT =O2** **1.9.6.1 ENABLE MEC. BRAKE= YES** **1.9.6.2 IN RUN - SPEED = I6** **1.9.6.3 OUT MEC. BRAKE = O1** **1.9.6.4 DELAY STOP = 0,250 s** **1.9.6.5 PERC In START = 30%** **1.9.6.6 DELAY START = 30.000s** **1.9.6.7 DELAY RAMP START=0,200s** **1.9.6.8 % In LIMIT SPEED =110%** **1.9.6.9 DELAY % In LIMIT=1,000s** **1.9.6.10 LIMIT SPEED =1500 rpm** **1.9.6.11 SPEED FAULT ENC. =20 rpm** **1.9.6.12 DELAY FAULT ENC. =0,500s**



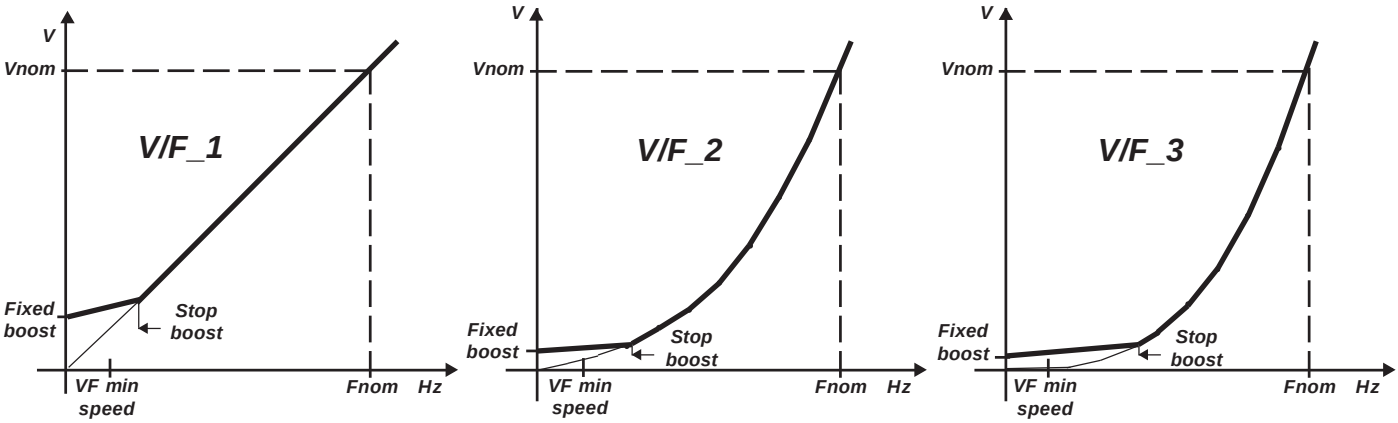


Key:

Pav = run forward + 2nd speed change
Pind =run backwards = 2nd speed change
Icm = overload contact (speed limitation)
FCav = run forward limit switch
FCind = run backwards limit switch
FCSav =forward safety limit switch
FCSind = backwards safety limit switch
TG = inverter power supply contactor
TF = brake command contactor
O1 = brake command inverter relay

V/F FEATURE

According to the motor load type, it is possible to select 3 V/F features by par. **1.5.3 V/F TYPE**.



Fnom= motor nominal frequency set in **par. 1.1.2 MOTOR NOM FREQUE** (motor plate data).

Vnom= motor nominal voltage set in **par. 1.1.3 MOTOR NOM VOLTAG** (motor plate data).

Fixed boost= voltage to be applied permanently to the motor by **par. 1.5.1 FIXED BOOST**; this voltage is active from 0Hz up to the frequency set in **par. 1.5.4 STOP BOOST FREQ.** and it is useful to improve low speed performances.

VFmin speed= frequency below which the RUN is stopped; it is calculated automatically as follows:
VFmin speed= (par.1.1.6 NAMEPLATE SLIP* par.1.5.2 MIN SPEED % SLIP)/100.

Stop boost= frequency to be set by **par.1.5.4 STOP BOOST FREQ**., exceeding which the boosts set in **par.1.5.1 FIXED BOOST** and **1.5.5 ACCELER BOOST** are reset.

V/F_1= linear trend feature; suitable for constant trend loads at all speeds.

V/F_2= quadratic trend feature; suitable for loads such as pomps or fans.

V/F_3= accentuated quadratic trend feature; suitable for loads such as pomps or fans.

To calculate the ideal value to be set as ***Fixed Boost***, run the **motor in no-load** just over the min speed **VF min speed** and in **par.1.5.1 FIXED BOOST** set a value bringing the motor absorbed current between ½ and ¾ of the nominal value.

To improve the high torque at start, it is possible to add a further voltage boost, enabled only during the acceleration ramp **by par.1.5.5 ACCELER BOOST**.

For a complete description of its related setups, see paragraph **1.5. VOLTS/Hz CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Pick-up function

This function is important when the inverter RUN is enabled and the motor is still rotating because of inertia. By pick-up function disabled, the inverter should brake the motor at the speed set starting from 0rpm; in case of loads causing big inertia such as fans or flywheels, this would determine the inverter block. By pick-up function, at RUN start, after 5s delay the inverter supplies directly the speed set as the motor real speed avoiding braking.

For pick-up enabling, set **par.1.5.6 ENABLE FLYING VF= YES**.

Pick-up function works properly up to a motor max. speed corresponding to 200Hz (e.g. 6000rpm for 4-poles motors), while the motor is seen as stopped while rotating at a frequency lower than 2,5Hz.

For a complete description of its related setups, see paragraph **1.5. VOLTS/Hz CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

In vector control the pick-up function is always enabled.

TORQUE augmentation (HIGH TORQUE)

This function, also known as **Automatic Boost**, allows to obtain significant torque even at low revs by voltage compensation of V/F curve. When the speed set exceeds the **V/F min speed** (see also **par.1.5.3 V/F TYPE**), the run is enabled and, as a consequence, the voltage compensation as well. If the motor absorbed current exceeds the value set in **par. 1.1.2 MOTOR NOM CURRENT**, the inverter increases (directly proportional) the motor voltage by a regulator, whose gain is set in **par.1.5.12 KP UP V/F**, up to the maximum value set in **par.1.5.10 PERC UP V/F**; The maximum duration of the boost increasing is fixed by **par.1.5.10.3 HT MAX TIME MSEC**; maximum speed set range in which control is enable is determined by **par.1.5.10.4 HT OVERL. SPEED** and **par.1.5.10.5 SPEED DISABLE HT**:
- If **par.1.5.10.4 HT OVERL. SPEED** is greater than **VF MIN SPEED** and **par.1.5.10.5 SPEED DISABLE HT = YES**, HT FUNCTION is disabled when ramp speed set exceeds **par.1.5.10.4 HT OVERL. SPEED** value.
- If **par.1.5.10.4 HT OVERL. SPEED** is lower than **VF MIN SPEED** and **par.1.5.10.5 SPEED DISABLE HT = NO**, HT FUNCTION is always enabled.

HIGH TORQUE function is disabled when one out of the two parameters **1.5.10 PERC UP V/F** and **1.5.2 KP UP V/F** is set at zero (default setup).
Parameters depend on the motor size: from an inquiry on drives coupled to different inverter sizes and by different manufacturers, some approximate values have been estimated to be set in the parameters. Those values (they are even default settings for any inverter) are reported in the table here below and are valid for motors having current/voltage as indicated, 4 poles and inverter PWM frequency 2KHz; the rest fo parameters which influence this function and don't depend on the motor size, are properly set as defaults by Rowan Elettronica staff for best performances.
If your motors data are different from the following list, please contact our Technical Department:

PARAMETERS			INVERTER POWER SIZES																						
		/P	/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6	/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F	/G
MOTOR NOM CURREN 1.1.2	A	3.0	5.0	7.0	9.0	12.0	15.0	22.0	30.0	35.0	45.0	60.0	72.0	87.0	106.0	138.0	165.0	205.0	245.0	300.0	410.0	460.0	550.0	655.0	780.0
NAMEPLATE SLIP 1.1.6	rpm	100	80	70	65	60	50	40	35	30	25	20	20	20	20	15	15	15	15	15	10	10	10	10	10
NAMEPLATE KWatt 1.1.7	KW	1.10	2.00	3.00	4.50	5.50	7.50	11.00	15.00	18.50	22.00	30.00	37.00	45.00	55.00	75.00	90.00	110.00	132.00	160.00	200.00	250.00	315.00	355.00	400.0
FIXED BOOST 1.5.1	%	3.1	3.0	3.0	3.0	2.8	2.7	2.5	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.4
PERC UP V/F 1.5.10.1	%	8.0	5.0	4.0	3.5	3.2	2.9	2.4	2.2	1.9	1.8	1.6	1.4	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
KP UP V/F 1.5.10.2	adim	45	30	23	21	19	17	15	13	11	10	8	7	6	6	5	5	4	4	3	3	3	2	2	2

Caution !

In order to prevent conflicts with the overload control function, when HIGH TORQUE function is enabled and par.1.5.9.1 ENABLE OVERLOAD is different from DISABLE, we suggest to set a value higher than 220.0% in par.1.5.9.2 MAX OVERLOAD CUR.

For a complete description of its related setups, see paragraph **1.5. VOLTS/Hz CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

SLIP COMPENSATION

This function enables to improve the precision in the motor speed control, above all during variations from void to full load. It is effective from nominal speed value to ¼ of this same value.

For the correct compensation functioning, the following parameters must be set:

-**Par.1.1.6 NAMEPLATE SLIP**; in this parameter rated slip of the motor must be set; It could be computed from the motor plate data through the rated frequency and rated speed or should be obtained as follows: in V/F scalar mode, set the out nominal frequency (e.g. 1500rpm), charge the motor at its nominal torque and check the real speed decrease. Set this value in par.1.1.6 NAMEPLATE SLIP.

-Par.1.1.8 NAMEPLATE COS (Ø); in this parameter the phase angle cosine function at the motor plate nominal torque must be set.

-**Par.1.5.8 NO LOAD I COS (Ø)**; the value to be set in this parameter is obtained as follows:

Run the motor void at its nominal speed (e.g. 1500rpm) and read **var.2.1.11 I X COS (Ø)**; this value must be set in par.1.5.8. To enable the slip compensation function, set **par.1.5.7 SLIP COMP ENABLE= YES**.

Once the function has been enabled, the real motor slip can be check in **var.2.1.12 MOTOR** SLIP V/F.

You will find here below a table with approximate setups for motors having current/voltage as indicated, 4 poles and inverter PWM frequency 2KHz:

PARAMETERS			INVERTER POWER SIZES																						
		/P	/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6	/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F	/G
MOTOR NOM CURREN 1.1.2	A	3.0	5.0	7.0	9.0	12.0	15.0	22.0	30.0	35.0	45.0	60.0	72.0	87.0	106.0	138.0	165.0	205.0	245.0	300.0	410.0	460.0	550.0	655.0	780.0
NAMEPLATE SLIP 1.1.6	rpm	100	80	70	65	60	50	40	35	30	25	20	20	20	20	15	15	15	15	15	10	10	10	10	10
NAMEPLATE KWatt 1.1.7	KW	1.10	2.00	3.00	4.50	5.50	7.50	11.00	15.00	18.50	22.0	30.00	37.00	45.00	55.00	75.00	90.00	110.00	132.00	160.00	200.00	250.00	315.00	355.00	450.00
NAMEPLATE COS(PHI) 1.1.8	cosphi	0.780	0.790	0.800	0.800	0.810	0.820	0.820	0.830	0.830	0.840	0.850	0.860	0.860	0.870	0.870	0.880	0.880	0.890	0.890	0.900	0.900	0.910	0.910	0.910
NOLOAD I COS(PHI) 1.5.8	A	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.6	1.6	1.7	1.8	1.9	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0

Motor max current limitation and BOOST voltage functions

In scalar control the following current limitation functions can operate together:

Slow Motor Current Limitation (Overload slow control)

This function enables to limit, in a slow way, the motor absorbtion at a max. value to be set in **par.1.5.9.2 MAX OVERLOAD CUR,** this is effective expecially when speed increase corresponds to load enhancement, i.e. for fans.

Parameters that regulate Overload control are in **1.5.9 OVERLOAD FUNC.** menu. This control can work in two ways:

If **par.1.5.9.1 ENABLE OVERLOAD = ON / OFF**, Overload is governed by a leap-system.

If **par.1.5.9.1 ENABLE OVERLOAD = REG_PI**, Overload is governed by P/I regulator whose gains can set in **par.1.5.9.5 KI REG OVERLOAD** and **par.1.5.9.6 KP OVERLOAD**.

When motor absorbed current exceeds in percent the value set in **par.1.5.9.2 MAX OVERLOAD CUR (in % of the motor rated current)**, the control starts decreasing the motor speed according to a ramp set in **par.1.5.9.4 DEC. RAMP. OVERLOAD**, until the absorbtion falls under the limit set; if the overload remains, the deceleration stops at the value set in **par.1.5.9.3 MIN OVERLOAD SPE**, even if the speed set is lower. In that case motor keeps at min speed for the time which is stored in **par.1.5.9.7 MIN SPEED TIME** even if current decreases under the limit. This state goes on until time expires or if **par.1.5.9.8 MIN SPEED UNLOCK** programmable input is enabled. WARNING: **MIN SPEED TIME** and **MIN SPEED UNLOCK** are used for air compressor special features, as default this is disabled (**par.1.5.9.7 MIN SPEED TIME = 0.0s**).

To disable slow motor current limitation set **par.1.5.9.1 ENABLE OVERLOAD = DISABLE** or **par.1.5.9.2 MAX OVERLOAD CURRENT= 300.0%**.

The overload control intervention is connected to the HIGH TORQUE function (menu ***1.5.10 HIGH TORQUE FUNC***) :
- By ***par.1.5.10.4 HT OVERL. SPEED = 0*** and even lower to or the same as ***VFmin speed*** (see parameter description ***1.5.3 V/F TYPE),*** the overload control is always active.
- By ***par.1.5.10.4 HT OVERL. SPEED*** upper to ***VFmin speed,*** the overload control is active when the speed set in ramp gest over the value set in ***par.1.5.10.4 HT OVERL. SPEED.***

Motor current quick limitation in acceleration phase and at full performance

Limitation in acceleration:

This function enables quick current limitation during full load starts or blocked rotor starts, preventing the sudden FAULT1 MAX PEAK CURRENT intervention.

Parameters that control quick limitation are in **1.5.11 CURRENT LIMIT**

Two kinds of limitation are possible, to be set by **par.1.5.12.1 MOD I LIM RAMP**:

STOP_RAMP= in this case, when the current exceeds the value set in **par.1.5.11.2 Imax ACC RAMP**, the speed ramp increase is stopped and if **par.1.5.11.3 PERC SLIP DEC** is different from ZERO, the frequency in ramp set is decreased for a speed that is equal to (1.1.6 NAMEPLATE SLIP * 1.5.11.3 PERC SLIP DEC)/100.

PI_RAMP= when the current exceeds the value set in **par.1.5.11.2 Imax ACC RAMP**, the PI regulator is started; the regulator output is taken from the reached speed set in ramp.

PI regulator gains can be set in **par.1.5.11.6 KP REG PI** and **1.5.11.7 KI REG PI.**

In any case, by motor current limitation enabled, the speed set can decrease up to **VF min speed**, so the motor keeps running at min. speed. (below **VF min speed** rate is disabled).

To disable this function, set **par.1.5.11.1 MOD I LIM RAMP= DISABLE.**

Limitation at full performance.

This function allow the speed limitation of the motor current in the functioning at costant speed, at the end of the acceleration phase. To enable the function, set ***par.1.5.11.4 MOD I LIM STEADY = PI_REG;*** in this case, when the speed set has finished the acceleration ramp and the instantaneous current gest over the value set in ***par.1.5.11.5 Imax STEADY***, the PI regulator is started; the regulator output is taken from the reached speed set in ramp.
PI regulator gains can be set in par. ***1.5.11.6 KP REG PI*** and par. ***1.5.11.7 KI REG PI.***

In any case, by motor current limitation enabled, the speed set can decrease up to **VF min speed**, so the motor keeps running at min. speed. (below **VF min speed** rate is disabled).
To disable this function, set ***par.1.5.11.4 MOD I LIM STEADY = DISABLE.***

BOOST voltage limitation

This function is appropriate for powerful motors that work in cold ambients, in this case BOOST voltage, which is generally necessary for starts on the spot, may cause over-absorption if the motor is not warmed-up.

A regulator limits BOOST voltage (which is the sum of all possible voltage BOOSTS) and prevent set MAx Current to be overtaken. The limitation is function of **par.1.5.11.2 Imax ACC RAMP** in acceleration and **par.1.5.11.5 Imax STEADY** at operating speed.

Control system stability is determined by **par.1.5.11.8 KP Imax BOOST**and **par.1.5.11.9 KI Imax BOOST.**

This function is disabled with **par.1.5.11.9 KI Imax BOOST = 0.**

PWM frequency hopping

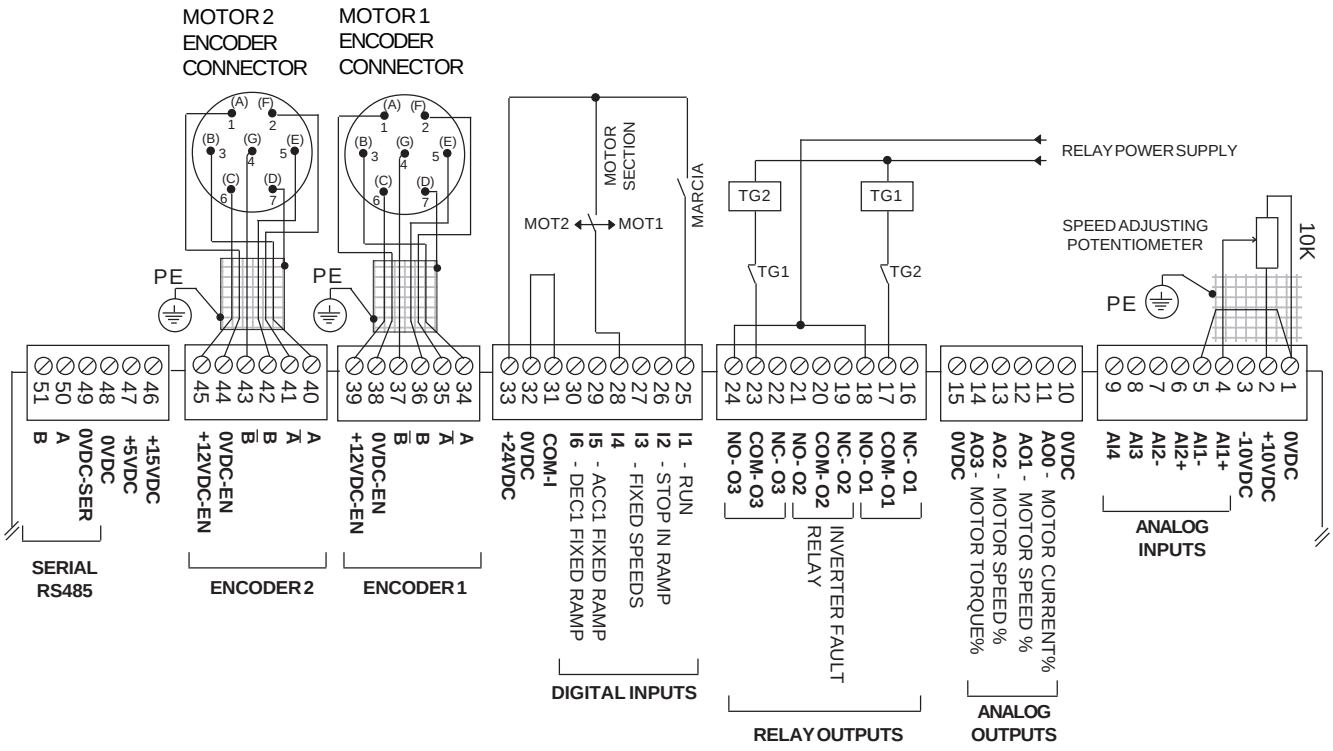
The automatic PWM frequency change in scalar control is important when powerful motors are driven and you need to limit the instability due to modulation pulses think times.

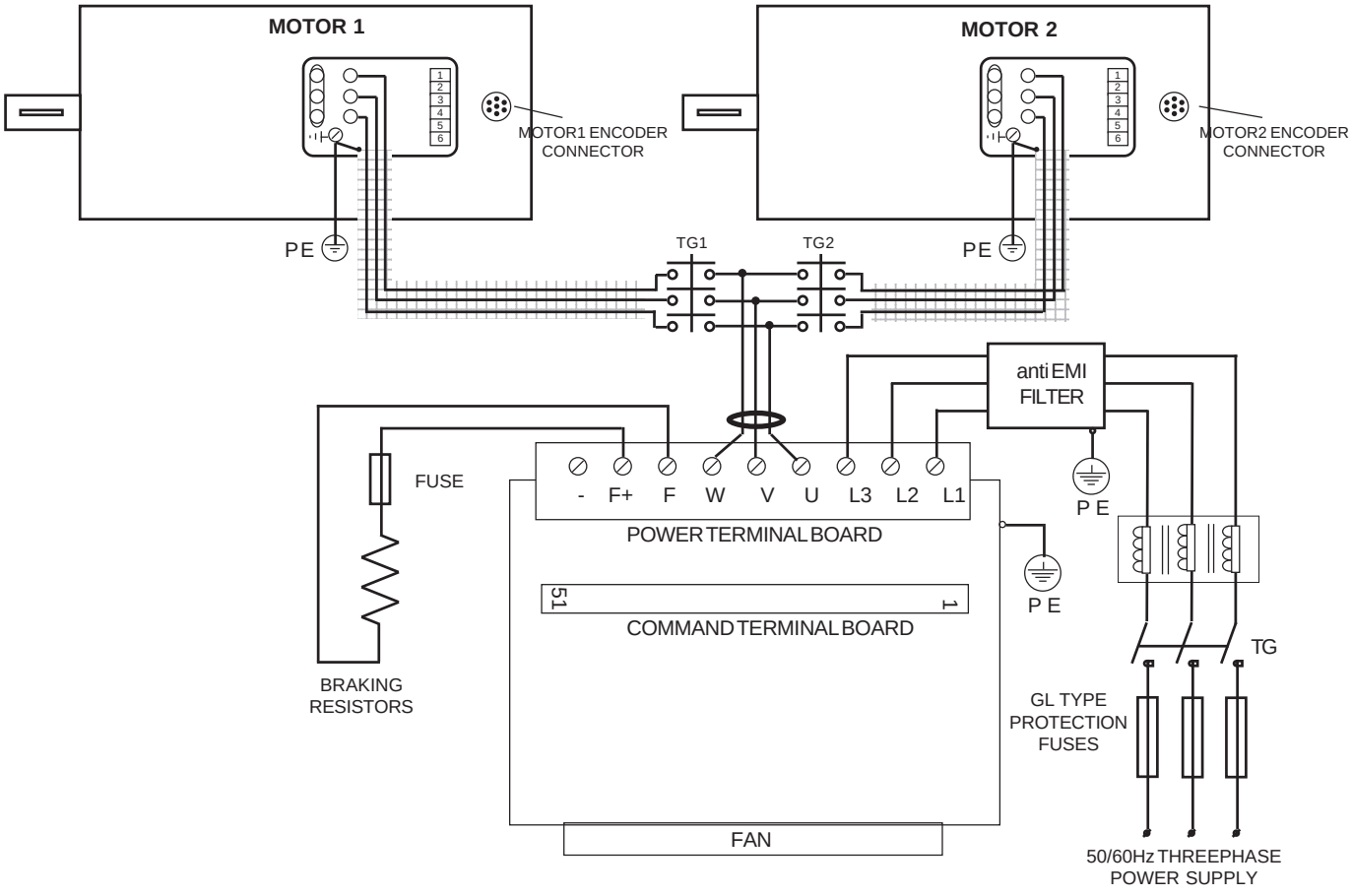
It is for this reason that a **low** PWM frequency is set at start (even 0.5KHz) in par.1.12.2 START PWM FREQ., in order to improve the think times internal compensation as well. Speed threshold set in par.1.12.3 CHANGE PWM SPEED exceeded, the PWM frequency values can be higher (e.g. 2KHz to be set in par.1.12.1 PWM FREQUENCY) to low the motor current ripple.

For a complete description of its related setups, see paragraph **1.12. PWM GENERATOR menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Selection of two vector motors controlled by the same drive

Plugging chart example:





Caution !

Follow the procedure below to enable the selection function (RUN command OFF):

When new functions are assigned to the inverter I/O resources, it is necessary to check that they havent been previousely programmed for a different function (see Chapter 13 SUMMARY TABLES FOR I/O RESOURCES ASSIGNATION PARAMETERS)

In this case, we can see that I4, O1, O2 have already been assigned default functions, so the following parameters must be modified:

3.1.6.9 IN2 SPEED= REMOTE

3.1.3.3 OUT THRESHOLD1= REMOTE

1.9.4 OUT RUN= REMOTE

- **Set MOTOR1 encoder pulse nr per revolution in** par.1.6.1 E1 ENCODER LINES
- **Set MOTOR2 encoder pulse nr per revolution in** par.1.6.6 E2 ENCODER LINES
- **Set the following parameters for digital I/O assignation related to the plugging chart example:**

par.3.1.10.2 OUT ENABLE MOT 1= O1
O1 ON commands the contactor connecting MOTOR1 to the inverter power output.
par.3.1.10.3 OUT ENABLE MOT 2= O3
O1 ON commands the contactor connecting MOTOR2 to the inverter power output.

Set **par.100.6.7 TYPE RESTORE= QUICK**; in this case only the following **restricted group** of parameters is transferred to the job buffer:

100.1 MOT CONTROL TYPE, 1.1.2 MOTOR NOM CURREN, 1.1.3 MOTOR NOM FREQUE, 1.1.4 MOTOR NOM VOLTAG, 1.1.5 MOTOR POLES, 1.2.1 RAMP ACCEL TIME, 1.2.2 RAMP DECEL TIME, 1.3.1 MAX MOTOR SPEED, 1.3.2 MIN MOTOR SPEED, 1.5.1 FIXED BOOST, 1.6.1 E1 ENCODER LINES, 1.6.4 VECT MAGNET CURR, 1.6.5 ROTOR CONST, 1.6.7 IN ENABLE ENC 2, 3.1.10 MOTOR ENABLE OUT.

- Select and set all MOTOR 1 parameters belonging to the **restricted group**, above all:
- Set **par.1.6.7 IN ENABLE ENC 2= REMOTE**
- Set **par.3.1.10.1 MOTOR ENABLE OUT= MOT_1**

All other parameters belonging to the restricted group depend on MOTOR 1 plate data.

- Set **par.100.6.3 SAVE SETUP= SETUP_1**
- Save MOTOR 1 parameters in SETUP1 buffer by **par.100.6.4 ENABLE SAVE= YES**

- Select and set all MOTOR 2 parameters belonging to the **restricted group**, above all:
- Set **par.1.6.7 IN ENABLE ENC 2= ENABLE**
- Set **par.3.1.10.1 MOTOR ENABLE OUT= MOT_2**

All other parameters belonging to the restricted group depend on MOTOR 2 plate data.

- Set **par.100.6.3 SAVE SETUP= SETUP_2**
- Save MOTOR 2 parameters in SETUP2 buffer by **par.100.6.4 ENABLE SAVE= YES**

At the end, assign the dedicated input and enable the set-up change function.
par. 100.6.6 IN RESTORE SETUP = I4
par. 100.6.5 IN START RESTORE = ENABLE.
Wait at least 1.0s, from this moment the inverter will read the I4 input state and so:
By I4 input OFF: loading of MOTOR 1 parameters.
By I4 input I4 ON: loading of MOTOR 2 parameters.
END SETUP

Motor selection sequence

MOTOR 1 SELECTION:

- Disable I1 RUN input and **enable** I4 MOTOR SELECTION input.
- Delay: at least 1.0s
- Enable I1 RUN input again.

MOTOR 2 SELECTION:

- Disable I1 RUN input and **disable** I4 MOTOR SELECTION input.
- Delay: at least 1.0s
- Enable I1 RUN input again.

Caution !

The selection can be performed in scalar control for 2 normal asynchronous motors too (**par.100.1 MOT CONTROL TYPE= V/F**); in this case, the parameters belonging to the restricted group related to 1.6 VECTOR ENCODER menu are irrelevant.

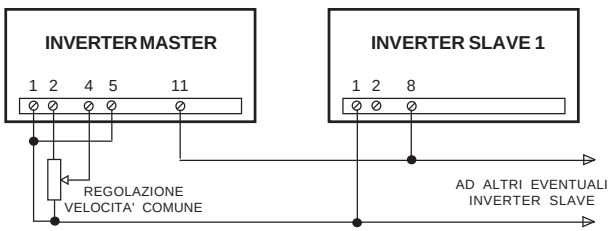
Torque control

In vectoR control, the torque can be managed as follows:
- TORQUE FIXED LIMITATION, by par.1.10.1 MAX TORQUE.
The limitation is always enabled, in absolute value for both torque signs, in all functions in menu 3. APPLICATIONS.
- TORQUE EXTERNAL CONTROL, by the source set in par.1.10.2 TORQUE SOURCE.
As for this parameter, it is possible to choose among the following adjusting sources:
- REMOTE = regulation by a value transferred in serial mode by the control variable with 301 address: TORQUE REFERENCE IN SERIAL MODE SETUP.
At the inverter start, if no value is transmitted, the set is = 0.
See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.
- AI1....AI5 = Torque adjusting by the selected analog input.
The input 100% (+/-10Vdc) corresponds to the value set in par.1.10.2 MAX TORQUE.
- MOTOPOT = Torque adjusting by 2 increase/decrease motopotentiometer-type digital inputs.
Digital inputs must be set in par.1.10.8 IN + TORQUE MOT and 1.10.9 IN - TORQUE MOT.
- OPERATOR = Torque adjustment by the keyboard by par.1.10.14 SET TORQ OPERAT.
(see paragraph **BASIC DATA menu description in OPERATOR mode**).
The max. torque adjusting corresponds to the value set in par.1.10.1 MAX TORQUE.

The external torque control is possible in the following ways:
EXTERNAL TORQUE LIMITATION IN ABSOLUTE VALUE
In this case, the torque is **limited** as max. value, without sign (only positive values), while the motor rotation direction is determined by the speed set source sign, selected in par.3.1.1.1 SPEED SOURCE.
(see MENU PARAMETERS DESCRIPTION 3.1.1 SPEED COMMANDS).
In this case, to enable the torque limitation it is necessary to:
- Choose a torque regulation source just for positive values:
e.g. AI3 analog input by par.1.10.2 TORQUE SOURCE = AI3 and par.4.3.3.3 TYPE INPUT = 0/+10V
- Set par.1.10.3 TORQUE CONTROL= **MAX_TORQ**
- Set inputs (or flags in serial mode) programmed in par.1.10.5 IN DX ENABLE LIM and 1.10.6 IN SX ENABLE LIM. Each input which has been activated enables the torque limitation separately for each rotation direction. Activate both inputs for torque limiting in any case.

EXTERNAL TORQUE SETUP WITH SIGN
In this case, the torque is **set** with its sign; the sign of the torque regulation source (positive and negative) determines the motor rotation direction, while speed is limited as max. value in par.1.3.1 MAX MOTOR SPEED or alternatively by max. speeds set in men 3.1.2 SPEED MAX; all further speed set sources are not enabled (e.g. STOP SPEED command is not enabled).
In this case, to enable the torque limitation it is necessary to:
- Choose a torque regulation source just for positive and negative values:
e.g. AI3 analog input by par.1.10.2 TORQUE SOURCE = **AI3** and par.4.3.3.3 TYPE INPUT = **-10V/+10V**
- Set par.1.10.3 TORQUE CONTROL = **SET_TORQ**
- Set par.1.10.5 IN DX ENABLE LIM = **ENABLE**.
This type of control is useful for applications where a torque bidirectional control is needed, as for PID load cell feedback external regulators.

Another application of this torque control is to drive 2 or more electric motor mechanically constrained on the same load, each one with its inverter of the same power size. An inverter is configured as master, in speed control, and the others are configured as slave. The analog signal +/-10V from the analog output AO0 of the master inverter (setting par. 4.4.2.1 = 6) is the reference torque signal (with sign) for the slave inverters, these set up as described in this paragraph. In this manner the load is equally distributed between all motors.
To more detailed instructions contact the Rowan Elettronica technical office.



For a complete description of torque control related setups, see paragraph **1.10. TORQUE CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

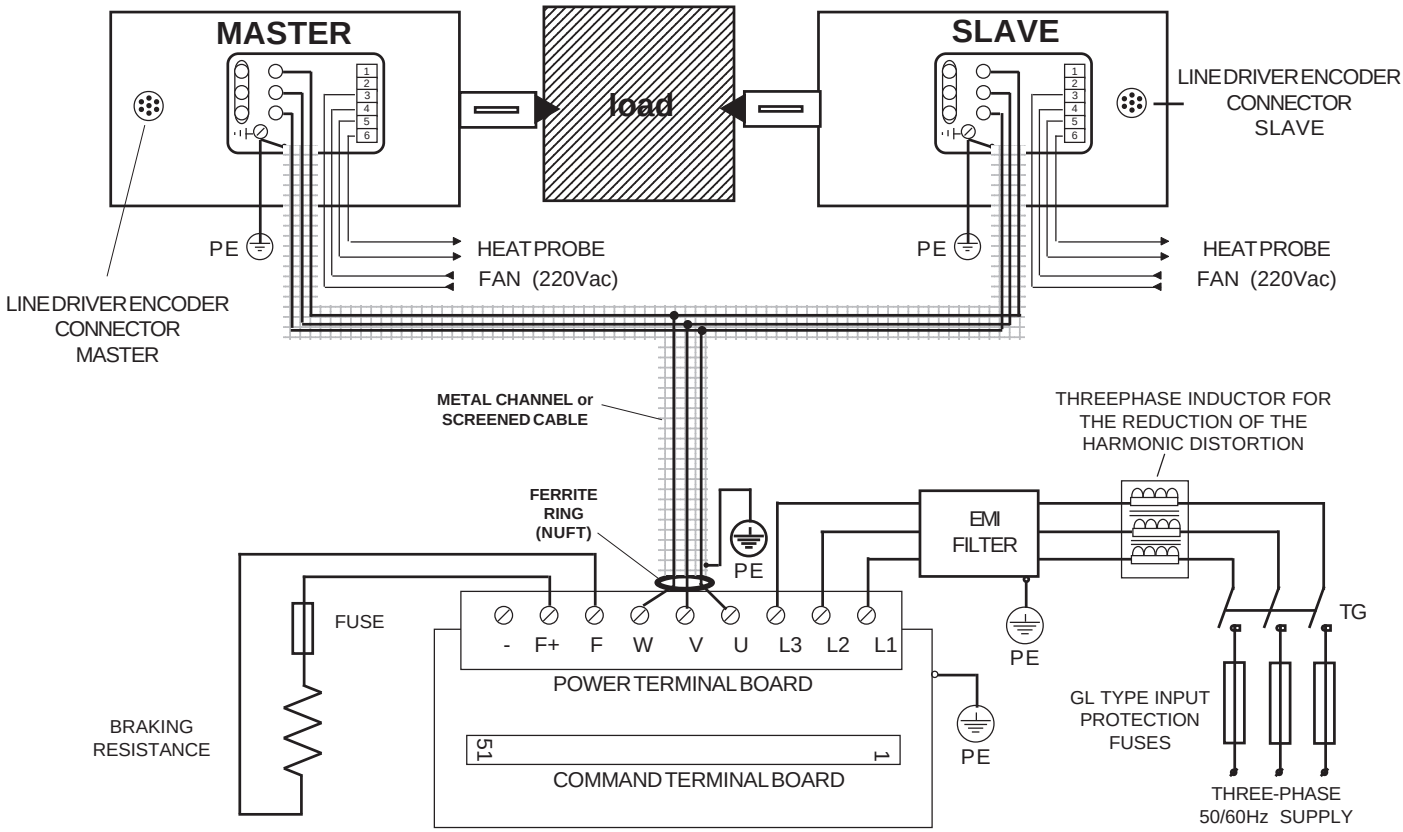
Integrity Control for the encoder mounted in the motor axis

In vector control is basic the correct functioning encoder installed in the motor shaft, necessary for the speed and the position feedback. If the inverter control doesn't find any counting on the ENCODER 1 input, in the presence of a speed reference, the motor could be rotate without control for a period time and in certains situations, create a several damage to the mechanic motion.
To prevent these situations is possible to activate (disable on the default setup) the encoder integrity control, as follow:
1) Activated the control with setup the par.1.9.6.11 SPEED FAULT ENC different from zero.
2) Setup the par.1.9.6.12 DELAY FAULT ENC the delay of FAULT10 intervention due the anomaly found from the encoder counting.

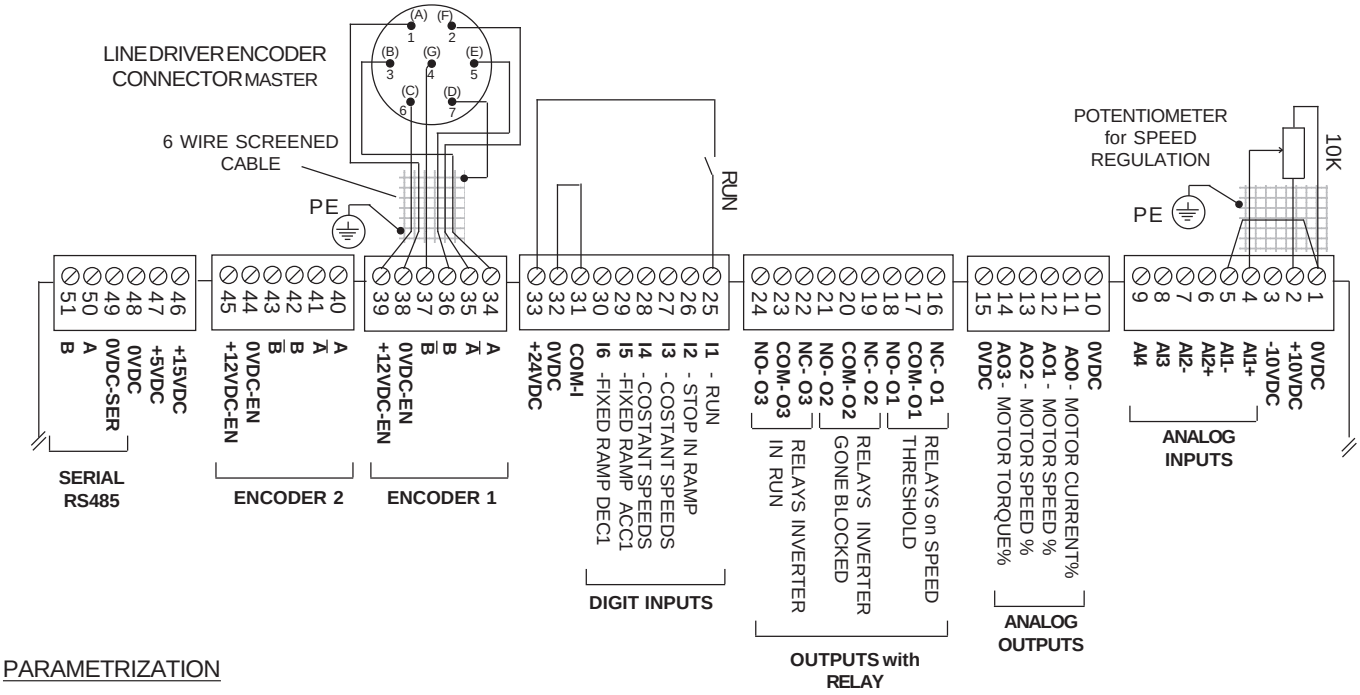
ATTENTION ! The control can't used:
- In the case of a system that contemplate as normal working the mechanic block of the motor to a predetermined torque. In this case the inverter will be generate the FAULT 10 (ex.: winding and unwinding function in torque regulation with C400W application, positioning with mechanical stop in limited torque with C400A inverter, etc..)
- **As safety system for the people (no SIL level).**

Example for commanding 2 vector motors in stiff connection with the same load and drived by the same inverter

Power terminal board connection diagram (Example with star connected motors)



Command terminal board connection diagram



PARAMETRIZATION

Follow same instructions from Chapt. 3-4 QUICK INSTALLATION IN SCALAR/VECTOR MODE except parameters to be read in Chapt. 19 G SERIES ROWAN MOTORS, on table "MOTOR / INVERTER PAIRING OFF".
In this case set those motor parameters the most near to the sum of the two motors power connected in parallel. If necessary contact the ROWAN ELETTRONICA technical dept.

Fault description and fault cause check

The inverter fault is indicated by the powering up of the FAULT fixed light on the keyboard and the powering off of the RUN light. If a digital output has been assigned to the inverter run by par.1.9.4 OUT RUN (default O3), this is disabled, even if the external RUN control is present with digital input I1.

If a digital output has been assigned to the inverter fault by par.1.9.5 OUT FAULT (default O2), this gets disabled. All inverter functions are brought back at RUN off.

In order to unserstand the cause of the inverter fault, it is necessary to enter menu 2.1 GENERAL VARIABLE and select var.2.1.16 LAST FAULT; in this variable the **fault nr** is displayed linked to the fault cause.

The displayed faults, as for operations common to all applications and SPEED application, are in table **FAULT LIST** on the following page. **Faults linked to applications different from SPEED are described in the manuals enclosed.**

Caution !

If the inverter is powered off after a fault, var.2.1.16 LAST FAULT is cleared; in this case, to understand the fault cause you must enter menu 2.3 FAULT HISTORY, where the most recent fault nr is displayed.

Inverter clearing after a Fault

In case of inverter fault, by FAULT light on the keyboard powered up, it is normally necessary to stop supplying the machine in order to reset the block. There are two possible procedures for clearing without turning the inverter off:

-By setting **par.1.9.2 I1 RESET FAULT= YES** when run is enabled by I1 digital input, the fault status is cleared automatically.

- By enabling serial flag or digital input control which is assigned in **par.1.9.7 IN RESET FAULT.**

Caution !

This function is not available if serious faults occur, for istance: FAULT nr4 SHORT IGBT MODUL, nr13 SHORT IGBT BRAKE and FAULT nr112, because this warnings imply turning off and technical inspection on the inverter.

Automatic restart after a fault

After some types of fault, it is possible to program the inverter so as it can start automatically at the set speed after a preset period of time.

The restart after a fault must be enabled by par.1.15.1 ENABLE= YES.

Four parameters (from 1.15.4 to 1.15.7) are available to set the fault nr after which the motor restart is wanted. When the inverter blocks because of one of these faults, after the period of time set in par.1.15.3 RESTART DELAY, the fault is cleared and the inverter starts again. The restart attempts nr is to be set in par.1.15.2 ATTEMPS; when the autorestart counter (var.2.1.36 COUNT AUTORESTART) reaches this value, the inverter blocks definitively for fault **nr 12, AUTORESTART FAULT** and the respective output is enabled, if it has been assigned before in **par.1.15.9 OUT RESTART END**; this particular output will be used to flag the final inverter block. Then, in order to reset the automatic restart function, it is necessary to power the inverter off and to supply it again; this way both the block condition and the autorestart counter are cleared.

However, the autorestart counter is cleared after the time period set in par.1.15.8 RESET TIME.

In order to verify the fault type, see the display variables group in FAULT HISTORY menu, which saved the last 10 faults occurred.

Caution !

This function is not enabled in case of faults nr 4 SHORT IGBT MODUL and nr 13 SHORT IGBT BRAKE, since those are serious damages, which must be checked immediately; to reset these faults it is necessary to power the inverter off and to power it up again, in order to clear the fault.

The fault reset function by RUN control (par.1.9.2 I1 RESET FAULT= YES) or by assigned control in par.1.9.7 RESET FAULT doesn't clear the autorestart counter, but only the restart delay time in par.1.15.3 RESTART DELAY.

See paragraph: **Menu parameters description 1.15 AUTORESTART** in Chapter 10 PARAMETERS AND VISUALISATIONS for a complete description of its related setups.

FAULT LIST

LAST FAULT
2.1.16 1.

MAX PEAK CURRENT

DESCRIPTION:
The maximum board cut-out output current at U V W has been reached. The cut-out current is indicated in the "*SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 400* " at chapt.5 TECHNICAL FEATURES
POSSIBLE CAUSES:
- Acceleration/deceleration ramps too short.
- Motor jammed.

POSSIBLE REMEDIES
- Lengthen the acceleration/deceleration ramps on set speed.
- Check the load on the motor and mechancial transmission.
- When using the V/F scalar control enable the rapid current limitation (consult the parameter menu 1.5.11 CURRENT LIMITS at chapt.10).

LAST FAULT
2.1.16 4.

SHORT IGBT MODUL

DESCRIPTION:
There is a phase to phase or phase to ground short-circuit at the U V W output.
POSSIBLE CAUSES:
- Motor connections shorted - Motor winding insulation damaged - Damaged part of inverter power.

POSSIBLE REMEDIES
Find the origin of the short-circuit as follows:
Power off the inverter and unhook the power wires at terminals U V W and then restore power:
- if the fault continues there is a problem in the inverter power drive that has to be repaired.
- if the fault disappears, first check the board to motor connections and then both the interwinding and ground insulation on the stator winding.

LAST FAULT
2.1.16 5.

BUS DC OVERVOLTAGE

DESCRIPTION:
The BUSDC voltage at terminals **F+** and **-** is over the maximum istantaneous value.
POSSIBLE CAUSES:
- Deceleration ramp is too short - Brake resistance is insufficient, connection is down or broken.

POSSIBLE REMEDIES
- Lengthen the deceleration ramp.
- Check the brake resistance and its connections are in perfect repair.
- Reduce the resistive level of the resistance according to the minimums indicated in the "*SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 400*" at chapt.5 TECHNICAL FEATURES.

LAST FAULT
2.1.16 8.

LINE OVERVOLTAGE

DESCRIPTION:
The inverter power voltage at terminals L1- L2- L3 is over its maximum limit.
POSSIBLE CAUSES:
See description.
POSSIBLE REMEDIES
Control the supply power range for the inverter under its order code (see chapt.18 DRIVES CODINGS) and compare it with the mains specifications. If necessary replace the inverter with one with a more suitable power range.

LAST FAULT
2.1.16 10.

FAULT ENCODER

DESCRIPTION:
Fault tripped in the vector control and only with the mechanical brake management enabled by **par.1.9.6.1 ENABLE MEC.BRAKE =YES**. The threshold is set in **par.1.9.6.11SPEED FAULT ENC** and **1.9.6.12 DELAY FAULT ENC**
POSSIBLE CAUSES:
- Encoder board connections down - encoder broken - motor cut-out by torque limiter.
POSSIBLE REMEDIES
- Check the inverter to encoder connections are in good order (ENCODER 1)
- Check the encoder is in working order. A typical method:
With the inverter drive off and no load on the motor, disengaged from the transmission, turn the shaft manually and check that **var.2.1.2 MOTOR SPEED** of the keypad displays the corresponding rotation speed.
- Check that the load is not too great or no parts are jammed.

LAST FAULT
2.1.16 11.

STALL FAULT

DESCRIPTION:
The output current at U V W is over the threshold in **par.1.14.2 CURRENT LIMIT**, for the time set at **par.1.14.1 STALL TIME**.
POSSIBLE CAUSES:
- Mechanical jam.
POSSIBLE REMEDIES
Disengage the motor from the transmission and check it operates correctly with no load. If the fault disappears, make sure nothing is jamming the mechanical transmission or the load is not excessive.

LAST FAULT
2.1.16 12.

AUTO-RESTART FAULT

DESCRIPTION:
The maximum number of autorestarts after a fault has been reached, as set in **par.1.15.2 ATTEMPTS**.
The number of autorestarts performed is displayed in the variable **2.1.36 COUNT AUTORESTART.**
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES
Control the last 10 faults in menu 2.3 FAULT HISTORY and take appropriate action.

LAST FAULT
2.1.16 13.

SHORT IGBT BRAKE

DESCRIPTION:
There is a short-circuit in the brake resistance connection at terminals F and F+
POSSIBLE CAUSES:
- Resistance connections shorted - Brake resistance shorted - Internal inverter brake module shorted.
POSSIBLE REMEDIES
Find the origin of the short-circuit as follows:
Power off the inverter and unhook the brake resistance terminals F and F+ and then restore power:
- if the fault continues there is a problem in the internal inverter module that has to be repaired.
- if the fault disappears, first check the board to resistance connections and then the brake resistance.

LAST FAULT
2.1.16 14.

OVERTEMPERATURE

DESCRIPTION:
The inverter cooler and stator cabinet temperature is over 80°C.
POSSIBLE CAUSES:
- Ambient temperature over 50°C - Inverter fans (if mounted on model) are not operating efficiently or obstructed.
POSSIBLE REMEDIES
- Control the ambient temperature of the inverter housing, if it is over 50°C the cooling system for the cabinet has to be uprated so the temperature drops within the working range.
- Check that the inverter fans operate efficiently (if mounted on model) and that the air flow is not obstructed. Naturally the inverter has to have been correctly mounted with the hot air being exhausted upwards as indicated in chapt.6 MECHANICAL INSTALLATION.

LAST FAULT 2.1.16	15.	FIRMWARE ERROR

DESCRIPTION:
The inverter has been programmed with an incompatible firmware.
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	16.	CAN C401 ERROR

DESCRIPTION:
Internal communication error in the inverter boards.
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	17.	OVER SPEED

DESCRIPTION:
The motor speed (displayed by par. 2.1.46 ENCODER SPEED) is over the maximum operating limit set by par. **1.3.1 MAX MOTOR SPEED** (active fault with encoder 1 connected only).
POSSIBLE CAUSES:
In torque control of 6-8 poles: if the torque sign (+ or -) is different from the speed sign.
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	18.	NOMINAL OVERLOAD BRAKING
LAST FAULT 2.1.16	19.	5 SEC OVERLOAD BRAKING

DESCRIPTION:
Faults 18, 19 both indicate overloading of the brake resistance connected to terminals F and F+.
POSSIBLE CAUSES:
Deceleration ramps too short and frequent - Motor brake torque too high (e.g. unwinders).
POSSIBLE REMEDIES
- Increase the deceleration ramp time
- Limit the motor brake torque.
- Increase the brake resistance power

LAST FAULT 2.1.16	20.	INVERTER OVERLOAD I^2 for 3s	200 ÷ 250% of the maximum output I inverter
LAST FAULT 2.1.16	21.	INVERTER OVERLOAD I^2 for 30s	150 ÷ 175% of the maximum output I inverter
LAST FAULT 2.1.16	22.	INVERTER OVERLOAD I^2 for 300s	110% of the maximum output I inverter
LAST FAULT 2.1.16	23.	INVERTER OVERLOAD In for 300s	overload upper to 110% continuous for 300s

DESCRIPTION:
Faults 20, 21, 22, 23 all indicate overloading of the inverter output at terminals U V W.
POSSIBLE CAUSES:
- Frequent start-stopping with short ramps - the motor is not compatible with the inverter ID plate data.
POSSIBLE REMEDIES:
- Limit the starts and stops and lengthen the acc/dec ramps.
- Adapt the motor power and inverter size.

LAST FAULT 2.1.16 30.	MOTOR OVERLOAD I² for 30s 200% of parameter 1.1.2
LAST FAULT 2.1.16 31.	MOTOR OVERLOAD I² for 300s 140% of parameter 1.1.2
LAST FAULT 2.1.16 32.	MOTOR OVERLOAD In for 300s 110% of parameter 1.1.2 continuous for 300s

DESCRIPTION:
Faults 30, 31, 32 all indicate overloading of the motor connected to inverter terminals U V W.
POSSIBLE CAUSES:
- Excessive load - Frequent start-stopping with short ramps - High friction in the mechanical transmittion.
POSSIBLE REMEDIES:
- Check the parameter settings in menu **1.1 INV/MOTOR DATA** and the real load on the motor
- Limit the starts and stops and lengthen the acc/dec ramps.
- Control the mechanical transmission.

LAST FAULT 2.1.16 33. — **MOTOR PTC OVERTEMPERATURE**

DESCRIPTION:
Motor PTC which is connected by AI4 analogic input (terminal nr.9) has detected overheating.
POSSIBLE CAUSES: - The motor is in overload - Motor ventilator is off - PTC is interrupted.
POSSIBLE REMEDIES: Check the connection - Check the actual motor load - Check cooling functioning / efficiency. To by-pass the PTC put par. 1.1.9 MOTOR PTC AI4 = 10.00V.

LAST FAULT 2.1.16 40. — **LOST COMMUNICATIONS**

DESCRIPTION:
Problems with the RS485 serial communications. No communications have been transmitted for longer than the time set at **par.5.2.7 INACTIVITY TIME**.
POSSIBLE CAUSES: - Serial connection at terminals 50 -51 is down
POSSIBLE REMEDIES: Check the connection - Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16 50. — **"STATIC" AUTOTUNING PROCEDURE FAILED**

DESCRIPTION:
The "static" autotuning procedure (par.1.7.5 ENABLE AUTO TUN = STATIC) it was canceled cause it determined setup values untrusted.
POSSIBLE CAUSES: Motor power too high for this procedure.
POSSIBLE REMEDES: Use the "on movement" autotuning procedure (par.1.7.5 ENABLE AUTO TUN = DYNAMIC).

LAST FAULT 2.1.16 80.	Incompatibility eeprom key: Product code, Firmware version, Hardware version.
LAST FAULT 2.1.16 81.	Incompatibility eeprom key: Product code, Firmware version.
LAST FAULT 2.1.16 82.	Incompatibility eeprom key: Product code, Hardware version.
LAST FAULT 2.1.16 83.	Incompatibility eeprom key: Product code.
LAST FAULT 2.1.16 84.	Incompatibility eeprom key: Firmware version, Hardware version.
LAST FAULT 2.1.16 85.	Incompatibility eeprom key: Firmware version.

LAST FAULT	
2.1.16	86.

Incompatibility eeprom key: Hardware version

DESCRIPTION:
All faults from 80 to 86 show incompatibility problems of the C411S eeprom key with the inverter at the moment of the command by par.100.6 Copy KEY>>INV =37 and forbid the parameters transferring into the inverter.
POSSIBLE CAUSES:
- See description by numerical code.
POSSIBLE REMEDIES
- Contact the Rowan Elettronica technical dept..

Alarm status description

When the FAULT light on the keyboard **flashes** the inverter is communicating an alert condition, this may not cause an immediate shutdown. The RUN light will remain on and the inverter functions will operate normally.

Control the cause of the alarm at **par.2.1.50 INVERTER ALARM**.

Any alarms on display, as for operations common to all applications and the SPEED application, are given in the **ALARM LIST** table below. **Alarms linked to applications different from SPEED are described in the specific manuals.**

ALARM LIST

INVERTER ALARM	
2.1.50	NONE

NONE

INVERTER ALARM	
2.1.50	CAP_LIFE

CAP_LIFE

DESCRIPTION:
The BUSDC capacity is at its maximum working hours recommended for safe operation. The inverter requires servicing by Rowan Elettronica

INVERTER ALARM	
2.1.50	PROG_IN

PROG_IN

DESCRIPTION:
Several functions have been assigned to the same digital input (see chapt. 13 *I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES)*. To disable the alarm set **par.100.7.1 ALARM PROG IN=NO**

INVERTER ALARM	
2.1.50	PROG_IN

PROG_OUT

DESCRIPTION:
Several functions have been assigned to the same digital output (see chapt.13 *I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES*). To disable the alarm set **par.100.7.2 ALARM PROG OUT=NO**

INVERTER ALARM	
2.1.50	STO_OPEN

STO_OPEN

DESCRIPTION:
Detection of supply interrupt on the inverter driver section. In the inverter with STO function, will be present on opening of the contacts between the clamps STO1 and STO2. When this allarm is active the RUN is inhibited.

For the alarm AXIS_LIM, consult the AXIS specific application manual: MANU.400A.
For the alarms COILDMIN, COILDMAX, CELLMAX, DANC UP, BREAK, consult the WINDER specific application manual: MANU.400W.

ORDER CODE FOR INVERTERS

Code : **C400 X / 1 . A . E . 12 . NN . NN . N**

ACTIVE APPLICATIONS (to be identified on the inverter by the nr on the right of the full stop, in var.2.1.38 FIRMWARE VERSION)

A	var. 2.1.38 = XXX01.XX	Active application: SPEED (speed control, scalar/vectorial) / AXIS (Positioner/electric axis)
R	var. 2.1.38 = XXX02.XX	Active application: SPEED (speed control, scalar/vectorial) / REGULATOR (P/I control)
G	var. 2.1.38 = XXX03.XX	Active application: SPEED (speed control, scalar/vectorial) / GEN_AFE (Sin Generator)
P	var. 2.1.38 = XXX04.XX	Active application: SPEED (speed control, scalar/vectorial) / CUSTOM1 (Custom Application)
W	var. 2.1.38 = XXX05.XX	Active application: SPEED (speed control, scalar/vectorial) / WINDER (Winding-Rewinding system)
F	var. 2.1.38 = XXX06.XX	Active application: SPEED (speed control, scalar/vectorial)) / AXIS (Positioner/electric axis) + (function of cutting die)

RELEASE HARDWARE

STO FUNCTION
S = WITH STO FUNCTION
N = WITHOUT STO FUNCTION

CUSTOMIZATION DIGITS
NN = NO CUSTOMIZATION

OPTIONAL EXPANSION CARD with I/O and FIELD BUS

Inputs / Outputs	Field bus
N = card without I/O **A** = card with I/O: - 1 line driver encoder - 2 zero input encoder - 8 digital inputs - 5 digital outputs - 5 analog inputs **B** = scheda con I/O: - 1 line driver encoder - 2 zero input encoder - 4 digital inputs - 2 digital outputs - 2 analog inputs	**N** = none **P** = PROFIBUS DPV1 **C** = CANOPEN **M** = MODBUS TCP/IP **E** = ETHERCAT **F** = PROFINET

NN = no expansion card

ENCODERS SUPPLY
05 = 5Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +5Vd
12 = 12Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +12Vdc
24 = 12Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +12Vdc

POWER SUPPLY VOLTAGE (50/60Hz)

Power supply voltage for inverters from /P to /3,5	*Power supply voltage for inverters from /5 to /G*
D = 220/240VAC **P** = 380/460 VAC **M** = 220/240 VAC SINGLE PHASE **N** = 500 VAC	**D** = 220/240VAC **E** = 380/400/415 VAC **O** = 440/460 VAC **W** = 690 VAC

DRIVE POWER SIZE
P - R - 0 - 0M -1 - L - 2 - 2,5 - 3 - 3,5 - 5 - 6 6,5 - 7 - 8 - 8,5 - 9 - A - B - C - D - E - F - G

Eeprom key order code

Code : **C411S . A**

HARDWARE RELEASE

Manual Code Description

>MANU.400S.QUICKSTART = INVERTER SERIES 400 use manual for a quick installation of the basic SCALAR V/F speed control on normal asynchronous motors and vector speed control of ROWAN G SERIES vector motors with ENCODER, **valid for all inverter codes 400.**

>MANU.400S = INVERTER SERIES 400 installation and use manual.
It is the complete manual for inverter and motors installation, independently from the application.
It includes SPEED application instructions, **valid for all inverter codes 400.**

>MANU.400TS = INVERTER SERIES 400 SERIAL TRANSMISSION.
It is an enclosure of MANU.400S basic installation manual; it includes all instruction for RS485 serial transmission operation, as for MODBUS RTU, CANOPEN, PROFIBUS protocols, **valid for all inverter codes 400.**

>MANU.400A = AXIS instruction manual for inverter with **XXX01.XX** e **XXX06.XX** firmware version.
It is an enclosure of MANU.400S complete installation manual, necessary to start inverters 400A and 400F series with AXIS Application, equipped with functions:electronic gear, positioner, fly cut and cutting die (only 400F).

>MANU.400R = REGULATOR instruction manual for inverter with **XXX02.XX** firmware version.
It is an enclosure of MANU.400S complete installation manual, necessary to start inverters 400R series with REGULATOR Application and its functions (compressor, cut at costant current)

>MANU.400G = GEN_AFE instruction manual for inverter with **XXX03.XX** firmware version.
It is an enclosure of MANU.400S complete installation manual, necessary to start inverters 400G series with GEN application (Voltage and Frequency regulated Sin Generator) and AFE application (Active Front End) for the recovery of energy toward the power supply line.

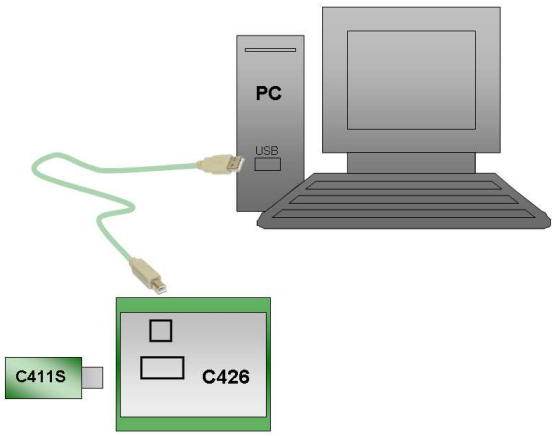
>MANU.400W = WINDER instruction manual for inverter with **XXX05.XX** firmware version.
It is an enclosure of MANU.400S complete installation manual, necessary to start inverters 400W series with WINDER application for winding - rewinding.

>**MANU.STO.350-400-700 =** Manual of safety STO function for the inverter 350, 400 and 700; for the inverter with STO this manual must be consider an integrity part of MANU.400S
>CATALOGUE MOTOR SERIES G = Complete catalog of the vector motors Rowan G series, with all the detailed specifications including the combination with the inverter 400 series.

● Software for eeprom key managing

On request, Rowan Elettronica provides the "**Rowan Key Manager**"; this software allows, through your PC, to elaborate the inverter parameters in eeprom key **cod. C411S**.

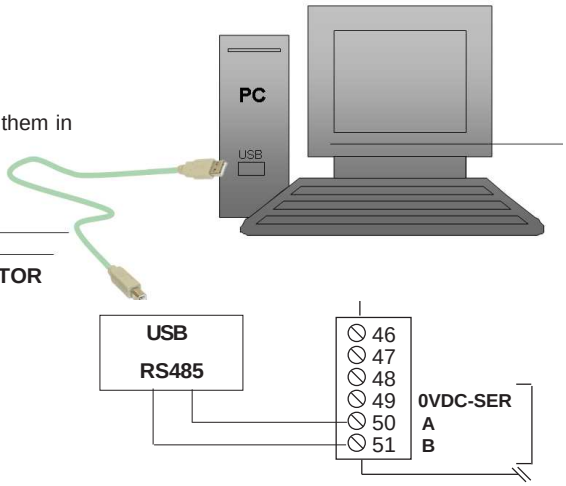
Through "**Rowan Key Manager**" it is allowed to:
> read all parameters contained in EEPROM key, in separated areas and save all datas in a file;
> export all parameters in Excel format and print them;
> save the elaborated data in the EEPROM key;
> read the total picture of the EEPROM key and save that in a file;
> import a total picture file on the key.
For all operations with C411S key an usb cable and interface board C426 are needed. Rowan Elettronica supplies the **KIT.426R.A**, that kit contains:
- installation cd with 2 versions of "**Rowan Key Manager**":
  > "**Rowan Key Manager**" for 350S inverter;
  > "**Rowan Key Manager**" for 400S inverter;
- USB cable A-B-M-M type;
- EEPROM key **C411S**;
- interface board **C426**.



● Software for editing the inverter parameters through PC: ROWAN DATA EDITOR

On request, Rowan Elettronica provides the "**Rowan Data Editor**", this software for Windows can be editing the inverter parameters directly from PC through RS485 serial connection:

Through "**Rowan Data Editor**" it is allowed to:
> read / modify all the inverter parameters and save them in a file.
> export the parameters read in format PDF or CSV.
> extract only the modificated parameters compared to default setup and save them in format PDF or CSV.
> with the "TEST MODE" function it is allowed command the inverter functions for a rotate motor test, monitoring the variable with the function "oscilloscope".
For all operations through PC and inverter is necessary a USB / RS485 converter (better if insulated)
On request Rowan Elettronica supplies the complete kit **KIT.ROWAN.DATAEDITOR** that contains:
- CD software installation "**Rowan Data Editor**";
- Complete connection cable from PC with USB/RS485 interface.



Inverter setup parameters for vector motors 1st SERIES, * 4 POLES, 1500 rpm, STAR connection

MOTOR (MEC) Code		90 TGD4...	90M TGV4...	90L TGE4...	100 TGF4...	100L TGK4...	112 TGG4...	112L TGH4...	112X TGY4...	112XL TGJ4...
Nominal Power Nominal Torque		1.5 kW 10.0 Nm	2.2 kW 15.0 Nm	3.5 kW 23.5 Nm	3.0 kW 20.0 Nm	6.0 kW 40.0 Nm	4.0 kW 27.5 Nm	5.5 kW 37.5 Nm	7.5 kW 48.0 Nm	10.5 kW 70.0 Nm
INVERTER 400		/ R	/ 0	/ 1	/ 1	/ L	/ 1	/ L	/ L	/ 2
Parameters	unit									
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400
1.1.2 MOTOR NOM CURREN	A	4.4	6.2	9.0	8.0	13.5	10.0	13.0	15.0	22.0
1.1.3 MOTOR NOM FREQUE	Hz	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1.1.4 MOTOR NOM VOLTAG	V	360	360	360	360	360	360	360	360	360
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.3.1 MAX MOTOR SPEED	rpm	1500	1500	1500	1500	1500	1500	1500	1500	1500
1.6.2 KP GAIN	-	25	20	20	20	25	30	35	35	45
1.6.3 KI GAIN	-	25	20	20	20	25	30	35	35	45
1.6.4 VECT MAGNET CURR	%	80.0	70.0	80.0	87.0	70.0	65.0	62.0	62.4	67.0
1.6.5 ROTOR COSTANT	Hz	12.0	13.0	15.0	14.0	8.3	5.5	7.0	4.9	5.2
1.10.15 ADAPT PERC TORQ.	%	144.0	145.0	140.0	165.0	135.0	127.0	132.0	123.4	117.5
1.10.16 ADAPT TORQ. [Nm]	%	154.0	123.0	128.0	140.0	120.0	114.0	113.0	118.0	112.5

MOTOR (MEC) Code		132 TGL4...	132L TGM4...	132XL TGN4...	160 TGP4...	160L TGR4...	160XL TGX4...
Nominal Power Nominal Torque		9.0 kW 60.0 Nm	11.0 kW 75.0 Nm	13.5 kW 90.0 Nm	15.0 kW 100.0 Nm	22.0 kW 150.0 Nm	31.0 kW 190.0 Nm
INVERTER 400		/ 2	/ 3	/ 3	/ 3	/ 3,5	/ 5
Parameters	unit						
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400
1.1.2 MOTOR NOM CURREN	A	21.0	25.0	30.0	32.0	45.0	58.0
1.1.3 MOTOR NOM FREQUE	Hz	50.0	50.0	50.0	50.0	50.0	50.0
1.1.4 MOTOR NOM VOLTAG	V	360	360	360	360	360	360
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	NO
1.3.1 MAX MOTOR SPEED	rpm	1500	1500	1500	1500	1500	1500
1.6.2 KP GAIN	-	50	50	50	50	20	50
1.6.3 KI GAIN	-	50	50	50	50	20	50
1.6.4 VECT MAGNET CURR	%	63.8	51.6	53.4	56.0	47.0	29.0
1.6.5 ROTOR COSTANT	Hz	5.6	5.4	4.4	2.7	3.9	6.6
1.10.15 ADAPT PERC TORQ.	%	117.6	122.0	115.0	115.0	110.0	111.0
1.10.16 ADAPT TORQ. [Nm]	%	100.0	103.3	97.5	102.0	103.5	110.0

* The current production (2013) of Rowan Elettronica vector motors, is made up of the 1st and 2nd SERIES:
- The vector motors of the 1st SERIES are identified by the technical characteristics described on a single label.
- The vector motors of the 2nd SERIES are identified by the technical characteristics described on two labels, they are all the motors that the Rowan Elettronica will produce from 2013 onwards, these motors will replace the 1st SERIES in end of production

Inverter setup parameters for vector motors 1st SERIES, * 4 POLES, 3000 rpm, DELTA connection

MOTOR (MEC) Code		63 TGA4...	63L TGI4...	71 TGB4...	71L TGQ4...	80 TGC4...		80L TGW4...		90 TGD4...		90M TGV4...	90L TGE4...		100 TGF4...		100L TGK4...	
Nominal Power Nominal Torque		0.28 kW 0.94 Nm	0.56 kW 1.88 Nm	0.56 kW 1.88 Nm	1.13 kW 3.75 Nm	1.13 kW 3.75 Nm		2.3 kW 7.5 Nm		2.3 kW 7.5 Nm		3.3 kW 11.0 Nm	5.3 kW 17.6 Nm		5.0 kW 15.0 Nm		9.0 kW 30.0 Nm	
INVERTER 400		/ P	/ P	/ P	/ R	/ P	/ R	/ R	/ 0	/ 0	/ 1	/ 1	/ L	/ 2	/ 1	/ L	/ 2	/ 3
Parameters	unit																	
1.1.1 LINE VOLTAGE	V	400	400	400	400	400		400		400		400	400		400		400	
1.1.2 MOTOR NOM CURREN	A	1.1	1.8	2.2	3.6	2.9		5.0	5.4	6.8		9.0	13		11.0		21.5	
1.1.3 MOTOR NOM FREQUE	Hz	100.0	100.0	100.0	100.0	100.0		100.0		100.0		100.0	100.0		100.0		100.0	
1.1.4 MOTOR NOM VOLTAG	V	410	410	410	410	410		410		410		410	410		410		410	
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES		4 POLES		4 POLES		4 POLES	4 POLES		4 POLES		4 POLES	
1.1.10 MOTOR LOAD FUNC	-	YES	YES	YES	YES	NO	YES	NO	YES	NO	YES	YES	NO	YES	NO	YES	NO	YES
1.3.1 MAX MOTOR SPEED	rpm	3000	3000	3000	3000	3000		3000		3000		3000	3000		3000	3000	3000	3000
1.6.2 KP GAIN	-	7	13	21	25	50	31	56	40	40	22	20	25	16	45	36	33	25
1.6.3 KI GAIN	-	7	13	21	25	50	31	56	40	40	22	20	25	16	45	36	33	25
1.6.4 VECT MAGNET CURR	%	87.0	85.0	85.0	81.8	74.0		64.0		75.0		75.0	80.0		73.0		82.0	
1.6.5 ROTOR COSTANT	Hz	65.0	30.0	15.0	10.5	10.2	16.3	7.7	11.0	8.0	14.0	12.5	9.6	14.9	8.0	9.8	6.3	8.1
1.10.15 ADAPT PERC TORQ.	%	245.0	173.0	172.4	144.9	128.5	130.6	131.7	143.0	150.0	150.0	149.0	155.0	154.3	140.0	139.6	145.0	144.4
1.10.16 ADAPT TORQ. [Nm]	%	100.0	76.3	67.8	61.2	75.6	63.0	73.7	70.0	56.8	53.9	59.5	63.0	62.3	62.5	56.8	61.0	56.9

MOTOR (MEC) Code		112 TGG4...		112L TGH4...		112X TGY4...		112XL TGJ4...		132 TGL4...		132L TGM4...		132XL TGN4...		160 TGP4...	160L TGR4...		160XL TGX4...	
Nominal Power Nominal Torque		6.0 kW 21.0 Nm		8.5 kW 28.0 Nm		10.8 kW 36.0 Nm		16.0 kW 53.0 Nm		14.0 kW 45.0 Nm		16.5 kW 56.0 Nm		20.0 kW 67.0 Nm		23.0 kW 75.0 Nm	34.0 kW 113.0 Nm		42.0 kW 143.0 Nm	
INVERTER 400		/ L	/ 2	/ 2	/ 3	/ 2	/ 3	/ 3	/ 3,5	/ 3	/ 3,5	/ 3	/ 3,5	/ 3,5	/ 5	/ 5	/ 6	/ 6,5	/ 6,5	/ 7
Parameters	unit																			
1.1.1 LINE VOLTAGE	V	400		400		400		400		400		400		400		400	400		400	
1.1.2 MOTOR NOM CURREN	A	14.7		20.0		22.0		34.0		30.0		34.0		44.0		48.0	72.0		75.0	
1.1.3 MOTOR NOM FREQUE	Hz	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	100.0		100.0	
1.1.4 MOTOR NOM VOLTAG	V	410		410		410		410		410		410		410		410	410		410	
1.1.5 MOTOR POLES	-	4 POLES		4 POLES		4 POLES		4 POLES		4 POLES		4 POLES		4 POLES		4 POLES	4 POLES		4 POLES	
1.1.10 MOTOR LOAD FUNC	-	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	YES	NO	YES	NO	YES
1.3.1 MAX MOTOR SPEED	rpm	3000		3000		3000		3000		3000		3000		3000		3000	3000		3000	
1.6.2 KP GAIN	-	50	32	45	34	35	27	45	26	50	29	50	32	50	42	42	30	25	50	41
1.6.3 KI GAIN	-	50	32	45	34	35	27	45	26	50	29	50	32	50	42	42	30	25	50	41
1.6.4 VECT MAGNET CURR	%	77.0		75.0		70.9		78.0		72.0		53.8		66.0		66.0	64.2		37.0	
1.6.5 ROTOR COSTANT	Hz	4.7	7.3	6.5	8.4	4.4	5.7	4.3	7.3	4.6	7.8	3.2	4.9	4.5	5.2	4.2	3.9	4.8	5.6	6.7
1.10.15 ADAPT PERC TORQ.	%	153.0	151.7	145.0	144.0	125.5	124.9	151.0	150.4	135.5	135.1	116.0	115.2	123.5	122.6	124.0	126.3	125.7	103.0	100.0
1.10.16 ADAPT TORQ. [Nm]	%	65.0	64.7	61.0	56.9	61.9	57.7	66.0	70.0	57.5	60.5	54.0	51.0	57	55.8	57.9	61.6	61.2	57.0	55.0

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Inverter setup parameters for vector motors 2nd SERIES, * 4 POLES, 1500 rpm, STAR connection

MOTOR (MEC) Code		63 TGA4...	63L TGI4...	71 TGB4...	71L TGQ4...	80 TGC4...	80L TGW4...	90 TGD4...	90M TGV4...	90M TGV4...	90L TGE4...	90L TGE4...	100 TGF4...	100L TGK4...	
Version		2	2	2	2	2	2	2	1	2	1	2	1	2	
Nominal Power Nominal Torque		0.25 kW 1.6 Nm	0.5 kW 3.2 Nm	0.6 kW 3.8 Nm	1.15 kW 7.3 Nm	1.2 kW 7.6 Nm	1.75 kW 11.2 Nm	1.9 kW 12.1 Nm	2.4 kW 15.3 Nm	2.7 kW 17.2 Nm	3.5 kW 22.3 Nm	3.7 kW 23.6 Nm	3.3 kW 21.0 Nm	6.3 kW 40.1 Nm	6.6 kW 42.0 Nm
INVERTER 400		/ P	/ P	/ P	/ R	/ R	/ R	/ R	/ 0	/ 0	/ 1	/ 0M	/ 0M	/ L	/ 2
Parameters	unit														
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400	400	400	400	400	400
1.1.2 MOTOR NOM CURREN	A	1.2	1.9	1.8	3.2	3.0	4.6	4.9	6.3	6.6	8.8	8.7	7.6	14.8	16.2
1.1.3 MOTOR NOM FREQUE	Hz	57.3	57.0	54.5	54.6	53.4	54.4	54.2	54.6	54.2	53.9	53.3	53.2	52.6	52.7
1.1.4 MOTOR NOM VOLTAG	V	345	357	365	368	365	356	378	384	385	396	392	380	379	385
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.3.1 MAX MOTOR SPEED	rpm	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
1.6.2 KP GAIN	-	5	10	15	15	20	50	50	50	50	45	50	50	40	35
1.6.3 KI GAIN	-	5	10	15	15	20	50	50	50	50	45	50	50	40	35
1.6.4 VECT MAGNET CURR	%	79.2	80.6	74.4	71.9	68.0	68.7	60.0	66.7	66.7	67.0	65.0	75.0	61.7	61.7
1.6.5 ROTOR COSTANT	Hz	70.7	41.2	25.7	23.1	19.7	12.7	13.5	16.0	14.5	18.9	11.2	11.0	8.5	12.8
1.6.13.1 KP ID REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
1.6.13.2 KI ID REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1.7.2 STATOR L	mH	538.2	372.6	461.3	301.5	327.1	198.4	197.1		153.4	127.1	121.1	136.0	81.7	
1.7.3 ROTOR L	mH	538.2	372.6	461.3	301.5	327.1	198.4	197.1		153.4	127.1	121.1	136.0	81.7	
1.7.4 MUTUAL INDUCT	mH	467.7	338.6	409.3	274.6	306.7	188.2	185.0		146.1	120.3	114.9	128.1	78.0	
1.10.15 ADAPT PERC TORQ.	%	163.8	168.9	149.7	144.9	135.7	135.1	125.7	142.5	130.0	136.6	138.0	139.0	129.0	126.4
1.10.16 ADAPT TORQ. [Nm]	%	88.7	115.6	128.4	123.9	129.8	121.5	116.0	121.2	118.0	113.0	138.5	142.0	104.5	97.8
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

MOTOR (MEC) Code		112 TGG4...	112L TGH4...	112X TGY4...	112XL TGJ4...	132 TGL4...		132L TGM4...	132XL TGN4...	160R TGT4...	160 TGP4...	160L TGR4...	160XL TGX4...	180 TGO4...	200 TGS4...
Version		1	2	5	2	2		2	2	2	2	4	1	2	2
Nominal Power Nominal Torque		4.6 kW 29.3 Nm	6.2 kW 39.5 Nm	7.2 kW 45.8 Nm	8.2 kW 52.2 Nm	9.7 kW 61.8 Nm	11.0 kW 70.0 Nm	13.0 kW 82.8 Nm	15.0 kW 95.5 Nm	10.0 kW 63.7 Nm	19.0 kW 121.0 Nm	22.5 kW 143.0 Nm	29.5 kW 187.8 Nm	37.0 kW 236.0 Nm	55.0 kW 350.0 Nm
INVERTER 400		/ 1	/ L	/ 2	/ 2	/ 2	/ 2,5	/ 2,5	/ 3	/ 2	/ 3,5	/ 5	/ 5	/ 6,5	/ 8
Parameters	unit														
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400	400	400	400	400	400
1.1.2 MOTOR NOM CURREN	A	10.8	14.0	17.6	21.9	22.0	23.7	28.5	34.1	22	44.3	49.0	60.0	87	120
1.1.3 MOTOR NOM FREQUE	Hz	52.6	52.2	52.2	51.9	52.7	52.0	51.7	51.5	51.2	51.3	51.1	51.2	51.1	51.1
1.1.4 MOTOR NOM VOLTAG	V	386	388	385	348	363	369	357	366	383	359	384	410	360	363
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.3.1 MAX MOTOR SPEED	rpm	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
1.6.2 KP GAIN	-	50	50	50	50	50	41	51	50	50	50	50	50	50	50
1.6.3 KI GAIN	-	50	50	50	50	50	41	51	50	50	50	50	50	50	50
1.6.4 VECT MAGNET CURR	%	55.0	60.7	66.5	66.7	45.0	45.5	47.0	54.5	50.0	58.9	52.4	41.6	50	45
1.6.5 ROTOR COSTANT	Hz	9.4	7.0	9.6	6.6	4.5	6.9	5.0	4.3	3.8	4.6	4.0	3.7	3.3	3.4
1.6.13.1 KP ID REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.6
1.6.13.2 KI ID REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.06
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.6
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.06
1.7.2 STATOR L	mH	109.2	79.8	63.9	48.0	51.3		43.6	37.7	62.6	31.0	31.1	27.6	15.3	11.5
1.7.3 ROTOR L	mH	109.2	79.8	63.9	48.0	51.3		43.6	37.7	62.6	31.0	31.1	27.6	15.3	11.5
1.7.4 MUTUAL INDUCT	mH	101.3	76.0	61.0	46.1	49.6		53.6	36.4	59.4	29.4	29.9	26.5	14.7	11.2
1.10.15 ADAPT PERC TORQ.	%	122.5	127.2	130.0	131.0	108.5	112.8	113.3	121.7	110.0	133.5	122.5	120.5	113.0	110.0
1.10.16 ADAPT TORQ. [Nm]	%	108.5	106.8	101.0	93.0	90.8	102.6	101.4	95.8	95.0	97.7	106.8	112.5	88.0	88.5
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

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- The vector motors of the 1st SERIES are identified by the technical characteristics described on a single label.
- The vector motors of the 2nd SERIES are identified by the technical characteristics described on two labels, they are all the motors that the Rowan Elettronica will produce from 2013 onwards, these motors will replace the 1st SERIES in end of production

Inverter setup parameters for vector motors 2nd SERIES, * 4 POLES, 3000 rpm, DELTA connection

MOTOR (MEC) Code		63 TGA4...	63L TGI4...	71 TGB4...	71L TGQ4...	80 TGC4...	80L TGW4...	90 TGD4...	90M TGV4...	90M TGV4...	90L TGE4...		90L TGE4...		100 TGF4...	100L TGK4...
Version		2	2	2	2	2	2	2	1	2	1		2		1	2
Nominal Power Nominal Torque		0.44 kW 1.4 Nm	0.94 kW 3.0 Nm	1.13 kW 3.6 Nm	1.9 kW 6.1 Nm	2.0 kW 6.4 Nm	2.9 kW 9.2 Nm	3.3 kW 10.5 Nm	3.8 kW 12.1 Nm	4.3 kW 13.7 Nm	5.5 kW 17.5 Nm		6.2 kW 19.7 Nm		5.8 kW 18.5 Nm	10.7 kW 34.1 Nm
INVERTER 400		/ P	/ R	/ P	/ R	/ R	/ 0M	/ 0M	/ 1	/ 1	/ L	/ 2	/ L	/ 2	/ L	/ 2,5
Parameters	unit															
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400	400		400		400	400
1.1.2 MOTOR NOM CURREN	A	1.9	3.2	3.0	4.8	4.7	7.2	7.7	9.8	10.7	13.7		14.5		12.7	23.6
1.1.3 MOTOR NOM FREQUE	Hz	106.8	106.9	105.0	104.4	103.7	103.2	103.6	102.9	102.7	103.3		102.9		102.5	102.4
1.1.4 MOTOR NOM VOLTAG	V	336	351	397	389	410	375	400	419	421	413		412		423	407
1.1.5 MOTOR POLES	-	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES	4 POLES		4 POLES		4 POLES	4 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES		YES		YES	YES
1.3.1 MAX MOTOR SPEED	rpm	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000		3000		3000	3000
1.6.2 KP GAIN	-	20	33	50	50	50	50	50	50	50	54	35	78	50	50	51
1.6.3 KI GAIN	-	20	33	50	50	50	50	50	50	50	54	35	78	50	50	51
1.6.4 VECT MAGNET CURR	%	85.0	80.0	75.0	70.0	78.7	69.4	72.0	80.0	79.0	70.0		65.5		77.0	64.8
1.6.5 ROTOR COSTANT	Hz	47.4	42.0	20.0	15.0	15.0	13.5	14.6	13.0	17.0	12.4	19.3	9.6	15.0	11.0	9.8
1.6.13.1 KP ID REGULATOR	-	0.95	0.95	0.95	0.95	0.45	0.45	0.95	0.95	0.95	0.95		0.95		0.95	0.95
1.6.13.2 KI ID REGULATOR	-	0.1	0.1	0.1	0.1	0.045	0.045	0.1	0.1	0.1	0.1		0.1		0.1	0.1
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95	0.95	0.95	0.45	0.45	0.95	0.95	0.95	0.95		0.95		0.95	0.95
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1	0.1	0.1	0.045	0.045	0.1	0.1	0.1	0.1		0.1		0.1	0.1
1.7.2 STATOR L	mH	179.4	124.2	153.8	100.5	109.0	66.1	65.7		51.1	42.4		40.4		45.3	27.2
1.7.3 ROTOR L	mH	179.4	124.2	153.8	100.5	109.0	66.1	65.7		51.1	42.4		40.4		45.3	27.2
1.7.4 MUTUAL INDUCT	mH	155.9	112.9	136.4	91.5	102.2	62.7	61.7		48.7	40.1		38.3		42.7	26.0
1.10.15 ADAPT PERC TORQ.	%	189.9	158.0	151.2	135.5	156.3	133.5	140.0	164.0	163.5	136.5	136.7	130.0	130.0	144.5	129.7
1.10.16 ADAPT TORQ. [Nm]	%	56.8	56.5	73.7	65.0	80.0	63.5	71.0	68.5	66.0	52.0	52.0	52.7	52.5	63.0	57.7
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

MOTOR (MEC) Code		112 TGG4...	112L TGH4...		112X TGY4...	112XL TGJ4...		132 TGL4...		132L TGM4...	132XL TGN4...	160R TGT4...	160 TGP4...		160L TGR4...		160XL TGX4...	180 TGO4...		200 TGS4...
Version		1	2		5	2		2		2	2	2	2		4		1	2		2
Nominal Power Nominal Torque		7.7 kW 24.5 Nm	9.5 kW 30.2 Nm		11.0 kW 35.0 Nm	12.5 kW 39.8 Nm		16.5 kW 52.5 Nm		17.5 kW 55.7 Nm	20.0 kW 63.7 Nm	16.0 kW 50.9 Nm	28.5 kW 90.7 Nm		33.7 kW 107.3 Nm		44.0 kW 140.0 Nm	54.0 kW 169.0 Nm		75.0 kW 238.0 Nm
INVERTER 400		/ 2	/ 2	/ 3	/ 2,5	/ 3	/ 3,5	/ 3	/ 3,5	/ 3,5	/ 5	/ 3	/ 6	/ 6,5	/ 6	/ 6,5	/ 7	/ 8	/ 8,5	/ 8,5
Parameters	unit																			
1.1.1 LINE VOLTAGE	V	400	400		400	400		400		400	400	400	400		400		400	400		400
1.1.2 MOTOR NOM CURREN	A	17.5	21.2		25.7	32.6		35.5		38.5	47.5	33.4	64.5		71.0		89.5	125.0		165.0
1.1.3 MOTOR NOM FREQUE	Hz	102.0	101.8		101.7	101.6		101.4		101.1	101.0	101.0	101.3		100.8		100.9	100.8		100.8
1.1.4 MOTOR NOM VOLTAG	V	429	418		411	377		416		403	409	426	410		428		467	402		363
1.1.5 MOTOR POLES	-	4 POLES	4 POLES		4 POLES	4 POLES		4 POLES		4 POLES	4 POLES	4 POLES	4 POLES		4 POLES		4 POLES	4 POLES		4 POLES
1.1.10 MOTOR LOAD FUNC	-	YES	YES		YES	YES		YES		YES	YES	YES	YES		YES		YES	YES		YES
1.3.1 MAX MOTOR SPEED	rpm	3000	3000		3000	3000		3000		3000	3000	3000	3000		3000		3000	3000		3000
1.6.2 KP GAIN	-	50	64	50	51	76	50	76	50	50	50	50	61	50	37	50	50	50	50	50
1.6.3 KI GAIN	-	50	64	50	51	76	50	76	50	50	50	50	61	50	37	50	50	50	50	50
1.6.4 VECT MAGNET CURR	%	63.0	63.2		71.6	72.0		58.0		68.0	70.7	60	67.4		59.0		51.7	50.0		45
1.6.5 ROTOR COSTANT	Hz	9.8	6.7	8.7	7.0	5.4	8.2	4.1	6.3	4.7	5.1	3.2	3.6	4.5	3.2	3.6	4.1	3.4	4.0	2.4
1.6.13.1 KP ID REGULATOR	-	0.95	0.95		0.45	0.45		0.6		0.6	0.45	0.45	0.45		0.45		0.95	0.33		0.33
1.6.13.2 KI ID REGULATOR	-	0.1	0.1		0.045	0.045		0.06		0.06	0.045	0.045	0.045		0.045		0.1	0.033		0.033
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95		0.45	0.45		0.6		0.6	0.45	0.45	0.45		0.45		0.95	0.33		0.33
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1		0.045	0.045		0.06		0.06	0.045	0.045	0.045		0.045		0.1	0.033		0.033
1.7.2 STATOR L	mH	36.4	26.6		21.3	16.0		17.1		14.5	12.6	20.9	10.3		10.4		9.2	5.1		3.8
1.7.3 ROTOR L	mH	36.4	26.6		21.3	16.0		17.1		14.5	12.6	20.9	10.3		10.4		9.2	5.1		3.8
1.7.4 MUTUAL INDUCT	mH	33.8	25.3		20.3	15.4		16.5		17.9	12.1	19.8	9.8		10.0		8.8	4.9		3.7
1.10.15 ADAPT PERC TORQ.	%	136.6	134.8	134.9	141.7	151.1	151.2	143.2	143.5	145.5	148.5	130	134.8	135.5	119.0	130.0	143.0	118.5	119.0	116.0
1.10.16 ADAPT TORQ. [Nm]	%	57.1	57.3	54.4	59.4	52.1	49.7	59.8	57.0	56.4	59.5	55.8	55.0	54.8	52.3	57.5	64.3	44.0	44.0	46.3
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

* The current production (2013) of Rowan Elettronica vector motors, is made up of the 1st and 2nd SERIES:
- The vector motors of the 1st SERIES are identified by the technical characteristics described on a single label.
- The vector motors of the 2nd SERIES are identified by the technical characteristics described on two labels, they are all the motors that the Rowan Elettronica will produce from 2013 onwards, these motors will replace the 1st SERIES in end of production

Inverter setup parameters for vector motors
2 POLES, 3000 rpm, STAR connection

MOTOR (MEC) Code		90 TGD2...	90M TGV2...	90L TGE2...	100 TGF2...	100L TGK2...	112 TGG2...	112L TGH2...	112X TGY2...	112XL TGJ2...
Version		1	1	2	1	1	2	1	2	2
Nominal Power Nominal Torque		2.0 kW 6.4 Nm	3.3 kW 10.5 Nm	4.5 kW 14.3 Nm	4.0 kW 12.7 Nm	7.5 kW 23.9 Nm	6.0 kW 19.1 Nm	8.3 kW 24.5 Nm	9.8 kW 31.2 Nm	11.2 kW 35.7 Nm
INVERTER 400		/ R	/ 0	/ 1	/ 0M	/ L	/ 1	/ 2	/ 2	/ 2,5
Parameters	unit									
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400
1.1.2 MOTOR NOM CURREN	A	4.2	7	9.4	9	15	12	17.7	20.6	23.4
1.1.3 MOTOR NOM FREQUE	Hz	53.4	52.5	52.0	52.2	51.6	51.6	51.5	51.2	51.0
1.1.4 MOTOR NOM VOLTAG	V	427	420	416	418	407	413	391	395	398
1.1.5 MOTOR POLES	-	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	NO	NO	NO	NO	NO	NO
1.3.1 MAX MOTOR SPEED	rpm	3000	3000	3000	3000	3000	3000	3000	3000	3000
1.6.2 KP GAIN	-	50	50	40	50	50	50	50	50	51
1.6.3 KI GAIN	-	50	50	40	50	50	50	50	50	51
1.6.4 VECT MAGNET CURR	%	45.2	50.0	42.6	50.0	46.6	43.3	46.9	49.5	50.8
1.6.5 ROTOR COSTANT	Hz	12.5	7.6	8.6	6.8	4.5	4.7	5.8	4.1	3.8
1.6.13.1 KP ID REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
1.6.13.2 KI ID REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
1.7.2 STATOR L	mH	473.4	262.7	192.8	235.5	124.4	127.9	119.4	115.6	71.4
1.7.3 ROTOR L	mH	473.4	262.7	192.8	235.5	124.4	127.9	119.4	115.6	71.4
1.7.4 MUTUAL INDUCT	mH	458.6	253.5	187.3	229.9	120.8	122.7	116	113.3	69.5
1.10.15 ADAPT PERC TORQ.	%	126	125.5	123.5	128.5	121.2	117.5	116.6	117.7	123.3
1.10.16 ADAPT TORQ. [Nm]	%	72	65.9	61.0	81.5	57.6	61.0	52.0	53.2	57.9
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

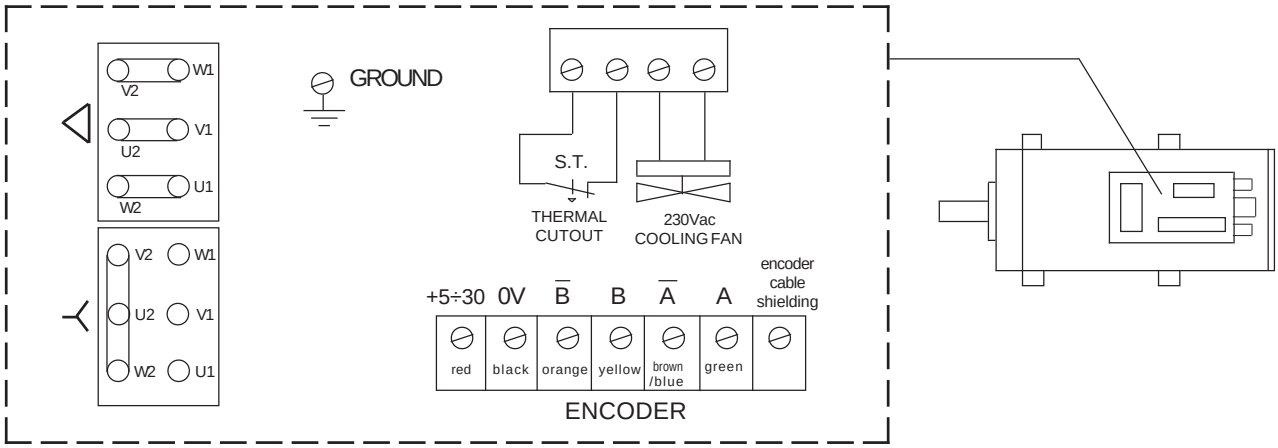
MOTOR (MEC) Code		132 TGL2...	132L TGM2...	132XL TGN2...	160R TGT2...	160 TGP2...	160L TGR2...	160XL TGX2...	180 TGO2...	200 TGS2...
Version		1	1	1	1	2	2	5	1	1
Nominal Power Nominal Torque		12.0 kW 38.2 Nm	14.0 kW 44.6 Nm	20.0 kW 63.7 Nm	12.5 kW 39.8 Nm	19.5 kW 62.1 Nm	26.5 kW 84.4 Nm	39.0 kW 124.1 Nm	48.0 kW 152.7 Nm	65.0 kW 207.0 Nm
INVERTER 400		/ 2,5	/ 2,5	/ 3,5	-	/ 3,5	/ 5	/ 6,5	-	-
Parameters	unit									
1.1.1 LINE VOLTAGE	V	400	400	400	-	400	400	400	-	-
1.1.2 MOTOR NOM CURREN	A	24.5	28.2	40.6	-	39.5	53.5	82.0	-	-
1.1.3 MOTOR NOM FREQUE	Hz	51.3	51.2	50.9	-	51.0	50.8	50.8	-	-
1.1.4 MOTOR NOM VOLTAG	V	390	410	407	-	408	381	406	-	-
1.1.5 MOTOR POLES	-	2 POLES	2 POLES	2 POLES	-	2 POLES	2 POLES	2 POLES	-	-
1.1.10 MOTOR LOAD FUNC	-	NO	NO	NO	-	NO	NO	NO	-	-
1.3.1 MAX MOTOR SPEED	rpm	3000	3000	3000	-	3000	3000	3000	-	-
1.6.2 KP GAIN	-	46	51	50	-	50	50	50	-	-
1.6.3 KI GAIN	-	46	51	50	-	50	50	50	-	-
1.6.4 VECT MAGNET CURR	%	43.7	44.7	58.0	-	57.2	47.5	31.1	-	-
1.6.5 ROTOR COSTANT	Hz	4.6	2.9	3.7	-	3.7	2.7	2.9	-	-
1.6.13.1 KP ID REGULATOR	-	0.95	0.95	0.95	-	0.95	0.95	0.95	-	-
1.6.13.2 KI ID REGULATOR	-	0.1	0.1	0.1	-	0.1	0.1	0.1	-	-
1.6.13.3 KP IQ REGULATOR	-	0.95	0.95	0.95	-	0.95	0.95	0.95	-	-
1.6.13.4 KI IQ REGULATOR	-	0.1	0.1	0.1	-	0.1	0.1	0.1	-	-
1.7.2 STATOR L	mH	86.9	80.6	56.0	-	62.8	41.5	37.2	-	-
1.7.3 ROTOR L	mH	86.9	80.6	56.0	-	62.8	41.5	37.2	-	-
1.7.4 MUTUAL INDUCT	mH	85.1	79.2	55.0	-	61.5	40.7	36.5	-	-
1.10.15 ADAPT PERC TORQ.	%	118.6	121.8	141.5	-	138.0	119.5	129.0	-	-
1.10.16 ADAPT TORQ. [Nm]	%	57.0	59.3	59.5	-	58.2	56.3	55.6	-	-
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	-	5.00	5.00	5.00	-	-

Inverter setup parameters for vector motors
2 POLES, 5000 rpm, DELTA connection

MOTOR (MEC) Code		90 TGD2...	90M TGV2...	90L TGE2...	100 TGF2...	100L TGK2...	112 TGG2...	112L TGH2...	112X TGY2...	112XL TGJ2...	
Version		1	1	2	1	1	2	1	2	2	
Nominal Power Nominal Torque		3.0 kW 5.7 Nm	5.5 kW 10.5 Nm	6.5 kW 12.4 Nm	6.0 kW 11.5 Nm	11.0 kW 21.0 Nm	9.0 kW 17.2 Nm	12.0 kW 22.9 Nm	13.5 kW 25.8 Nm	14.5 kW 27.7 Nm	
INVERTER 400		/ 0	/ 1	/ L	/ L	/ 2,5	/ 2	/ 2,5	/ 2,5	/ 3	/ 3,5
Parameters	unit										
1.1.1 LINE VOLTAGE	V	400	400	400	400	400	400	400	400	400	
1.1.2 MOTOR NOM CURREN	A	6.2	12.0	14.0	14.0	22.8	19.2	26.2	29.7	33.8	
1.1.3 MOTOR NOM FREQUE	Hz	86.1	85.7	85.2	85.1	84.8	84.7	84.7	84.4	84.1	
1.1.4 MOTOR NOM VOLTAG	V	398	392	394	394	376	392	367	369	367	
1.1.5 MOTOR POLES	-	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	2 POLES	
1.1.10 MOTOR LOAD FUNC	-	YES	NO	YES	YES	NO	YES	NO	YES	YES	
1.3.1 MAX MOTOR SPEED	rpm	5000	5000	5000	5000	5000	5000	5000	5000	5000	
1.6.2 KP GAIN	-	50	50	50	50	51	50	46	51	76	50
1.6.3 KI GAIN	-	50	50	50	50	51	50	46	51	76	50
1.6.4 VECT MAGNET CURR	%	54.8	52.5	50.0	53.6	50.9	54.7	48.1	56.2	61.2	
1.6.5 ROTOR COSTANT	Hz	9.5	7.2	6.1	6.4	5.6	4.8	4.3	2.9	2.5	3.8
1.6.13.1 KP ID REGULATOR	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
1.6.13.2 KI ID REGULATOR	-	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
1.6.13.3 KP IQ REGULATOR	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
1.6.13.4 KI IQ REGULATOR	-	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
1.7.2 STATOR L	mH	157.8	87.6	64.3	78.5	41.5	42.6	39.8	38.5	23.8	
1.7.3 ROTOR L	mH	157.8	87.6	64.3	78.5	41.5	42.6	39.8	38.5	23.8	
1.7.4 MUTUAL INDUCT	mH	152.9	84.5	62.4	76.6	40.3	40.9	38.7	37.8	23.2	
1.10.15 ADAPT PERC TORQ.	%	115.0	122.0	124.5	130.5	114.1	119.0	114.9	117.1	133.5	134.2
1.10.16 ADAPT TORQ. [Nm]	%	37.5	35.0	32.7	32.0	32.4	32.0	30.9	31.3	30.9	29.6
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

MOTOR (MEC) Code		132 TGL2...	132L TGM2...	132XL TGN2...		160R TGT2...	160 TGP2...		160L TGR2...		160XL TGX2...		180 TGO2...	200 TGS2...
Version		1	1	1		1	2		2		5		1	1
Nominal Power Nominal Torque		16.5 kW 31.5 Nm	18.0 kW 35.3 Nm	26.0 kW 49.7 Nm		19.0 kW 36.3 Nm	25.0 kW 47.8 Nm		32.0 kW 61.1 Nm		50.0 kW 95.5 Nm		60.0 kW 114.6 Nm	80.0 kW 153.0 Nm
INVERTER 400		/ 3,5	/ 3,5	/ 5	/ 6	-	/ 5	/ 6	/ 6	/ 6,5	/ 7	/ 8	-	-
Parameters	unit													
1.1.1 LINE VOLTAGE	V	400	400	400		-	400		400		400		-	-
1.1.2 MOTOR NOM CURREN	A	36.2	40.9	57.8	57.0	-	55.3		72.0	73.3	106		-	-
1.1.3 MOTOR NOM FREQUE	Hz	84.3	84.3	84.0		-	84.0		83.9		84.0		-	-
1.1.4 MOTOR NOM VOLTAG	V	370	370	386		-	388		364		398		-	-
1.1.5 MOTOR POLES	-	2 POLES	2 POLES	2 POLES		-	2 POLES		2 POLES		2 POLES		-	-
1.1.10 MOTOR LOAD FUNC	-	YES	YES	YES		-	YES		YES		YES		-	-
1.3.1 MAX MOTOR SPEED	rpm	5000	5000	5000		-	5000		5000		5000		-	-
1.6.2 KP GAIN	-	50	40	50	50	-	60	50	73	60	50	50	-	-
1.6.3 KI GAIN	-	50	40	50	50	-	60	50	73	60	50	50	-	-
1.6.4 VECT MAGNET CURR	%	56.6	63.5	64	63.8	-	66.0		61.4		44.5		-	-
1.6.5 ROTOR COSTANT	Hz	3.8	3.0	2.7	3.1	-	2.5	3.1	2.0	2.5	2.0	2.9	-	-
1.6.13.1 KP ID REGULATOR	-	0.45	0.45	045		-	045		045		045		-	-
1.6.13.2 KI ID REGULATOR	-	0.045	0.045	0.045		-	0.045		0.045		0.045		-	-
1.6.13.3 KP IQ REGULATOR	-	0.45	0.45	045		-	045		045		045		-	-
1.6.13.4 KI IQ REGULATOR	-	0.045	0.045	0.045		-	0.045		0.045		0.045		-	-
1.7.2 STATOR L	mH	29.0	26.9	18.7		-	20.9		13.8		12.4		-	-
1.7.3 ROTOR L	mH	29.0	26.9	18.7		-	20.9		13.8		12.4		-	-
1.7.4 MUTUAL INDUCT	mH	28.4	26.4	18.3		-	20.5		13.6		12.2		-	-
1.10.15 ADAPT PERC TORQ.	%	129.0	135.5	137.8	132.5	-	137.1	137.8	132.1	132.4	127.5	127.7	-	-
1.10.16 ADAPT TORQ. [Nm]	%	30.2	31.2	35.4	33.5	-	35.4	34.5	32.0	31.8	33.0	31.6	-	-
1.12.1 PWM FREQUENCY	kHz	5.00	5.00	5.00		-	5.00		5.00		5.00		-	-

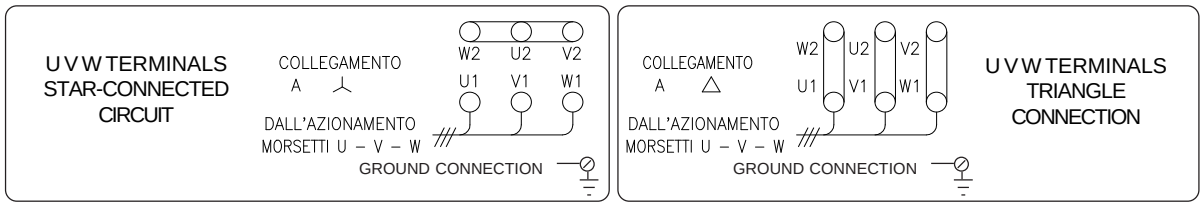
MEC 63 al 80L motors connection



In this motors series, the power connection can be performed at STAR or DELTA.
The terminals of power, services and encoder are all enclosed in the same terminal boxes.

MEC 90 to 200 motors three-phase supply connection

In this motors series, the power connection can be performed at STAR or DELTA:



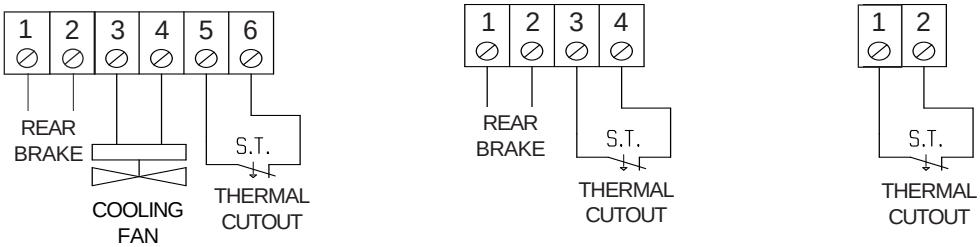
The star or delta connection depends by the combination with the inverter 400.

Refer to the tables "ROWAN G-SERIES VECTOR MOTORS SETTINGS" of the chapter 13 or the CATALOGUE ROWAN G SERIES MOTORS" if you want more insight into the combination technical characteristics between the inverter and the Rowan vectorial motors.

Thermal probe connection

The thermal probe is a N.C. type command, which opens when the motor windings temperature exceeds 150°C, a safety limit corresponding with H class (180°C). It is used as emercency device for the power contactor break, keeping in mind that the contact max. current-carrying capacity is 1A-230VAC.

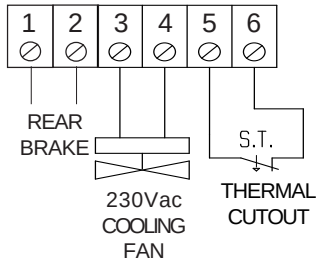
According to the type of motor, the thermal probe connection can be placed in the following terminal types:

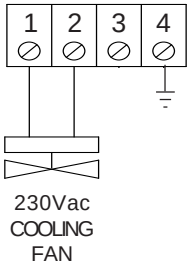


Fan connection

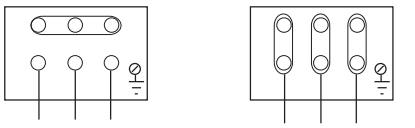
Supply the fan with power even if the motor is not operating, so that even pauses are used for cooling as well.
For the power characteristics, refer to the "CATALOGUE ROWAN G SERIES MOTORS"

According to the type of motor, the fan connection can be placed in the following terminal boards types:





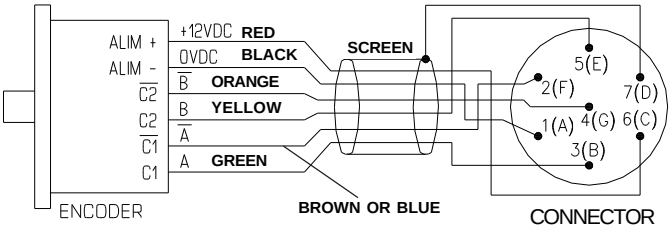
THREEPHASE COCHLEAR FANS (DIRECT CONNECTION IN THE FAN MOTOR HEADER)



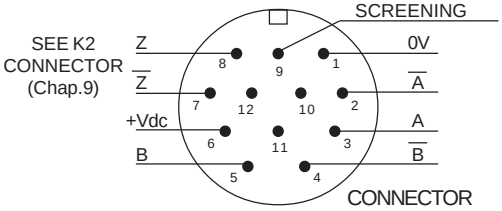
LINE DRIVER encoder connector

Rowan G series **standard** motors are equipped with LINE DRIVER encoder, with +12VDC power voltage, 1000 pulses/r resolution.Encoders with different resolutions and +5Vdc power voltage are available on request. In case of +5Vdc power voltage, the inverter as well must be modified.

Power supply and encoder phase signals are driven to the connector on the motor as shown in the drawing below:



encoder with zero



The standard encoder connection for speed feedback is related ENC
In this case, set the **par.1.6.7 IN ENC 2** = **REMOTE.**
The number of pulses / rev encoder must be set in **par.1.6.1 E1 ENCODER LINES**

MOTOR ENCODER OUTPUT EMPLOY WITH SEVERAL C400 INVERTERS OR OTHER DEVICE

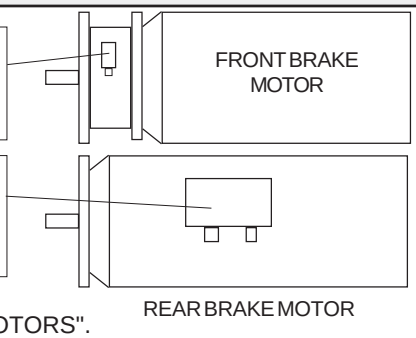
You can easily connect a motor encoder to other devices as long as:

- connection is by screening cable
- 20mA max absorption for each encoder channel both for 12Vdc and 5Vdc.

Brake connection

In the **standard front brake version**, the brake connection is performed by a connector with 4 pins numbered on the brake-holder bell. Connect the brake to connector terminals 1 and 2.

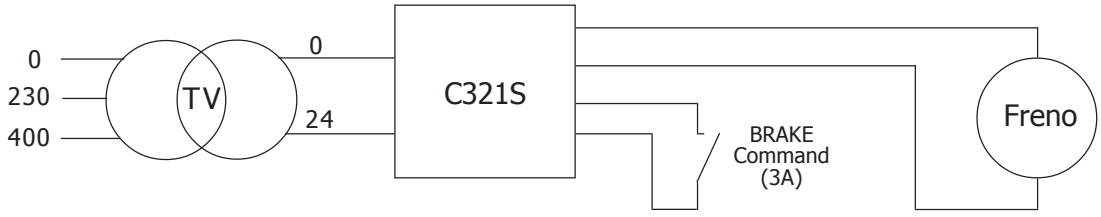
In the special rear brake version, the brake connection is performed by a facility terminal board placed close to the power terminal board.
Supply brake to terminals 1 and 2.



For the power characteristics, refer to the "CATALOGUE ROWAN G SERIES MOTORS".

The brake operates at 24 VDC direct voltage with following duty-cycle: 5 minutes in excited condition and 5 minutes rest.

For optimizing the BRAKE managing, Rowan Elettronica proposes the C321S card connected a follows:



The C321S gives a 34Vdc starting voltage and a following 24Vdc mantaining voltage. In this way the BRAKE release is faster and we avoid overtemperature during the continuous service.

Instruction for the correct autotuning procedure

C400 Inverter autotuning function

From the firmware 499.0x.00 version is available in the C400 inverter a procedure of auto-setting to control the asynchronous motors. The procedure execute a motor measures connected to the terminals U, V, W to determinate which are the parameters necessary to a correct vector control function.
Execute the installation procedure of the vector control describe in the Chapter 4, after settled the par.1.6.1 E1 ENCODER LINES value, is possible to activated the autotuning procedure.
The procedure is enable through the par.1.7.5 ENABLE AUTO TUN, normally in default settled NO. There are available 2 different autotuning procedure the choose depends the possibility and what the machine needs: STATIC, auto-setting "stationary" and DYNAMIC, auto-setting “on movement”.
The procedure is activable only in the SPEED application (par.100.5 APPLICATION = SPEED).

1.7.5 ENABLE AUTO TUN = STATIC

Settings STATIC you choose the auto-setting "stationary", the settings parameters are determinate through the measures on the motor without rotate the shaft. The motor can be connect to the load without create any problems.
Once set STATIC, enabling the run contact, the procedure starting and the run led switch-on. When the par.1.7.5 ENABLE AUTO TUN back equal to NO the procedure is finished.
Removing the run contact, the setup parameters of the vector control will be updated.
With a following run switch-on, the motor is controlled in vector control.
The execution of these procedure, is suggested for the motor lower than 30kW.

1.7.5 ENABLE AUTO TUN = DYNAMIC

With this setup you choose the autotuning procedure "on movement", during the execution the motor shaft rotate.
Mustn't connect to any load to the motor shaft.
Once setup DYNAMIC, enabling the run contact, the procedure starting and the run led switch-on.
When the par.1.7.5 ENABLE AUTO TUN back equal to NO the procedure is finished.
Removing the run contact, the setup parameters of the vector control will be updated.
With a following run switch-on, the motor is controlled in vector control.
The execution of these procedure, is suggested for the motor bigger than 30kW.

Updated parameters from the procedure:

At the end of the autotuning procedure, when removing the run contact, are updated the follows parameters:
(the accepted precision tolerance is the 10%).

1.6.4 VECT MAGNET CURR.
1.6.5 ROTOR CONSTANT
1.10.15 ADAPT PERC TORQ
1.7.2 STATOR L
1.7.3 ROTOR L
1.7.4 MUTUAL INDUC

The **POSITIONER** function available for the C400A series has the specific manual **MANU.400A**. You can DOWNLOAD it from **www.rowan.it**

To get more detailed characteristics of the Rowan vectorial motors, you can download the catalog in the download area from our website **www.rowan.it**

Rowan Elettronica

Motors, drives, accessories and services for automations

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